SEPTEMBER 1959

UNITED STATES ARMY AVIATION DIGEST

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ON-THE-JOB TRAINING

Lieutenant Carroll O. Durham, Inf

AT ANY given time and place where two or more aircraft maintenance officers meet, there are two factors around which most of the conversation will revolve: parts and personnel. The parts situation can generally be improved by following accepted supply procedures and maintaining the authorized level of spare parts.

As aircraft maintenance officers, there is much we can do at the organizational level to improve the training and standards of the people who do the work on our aircraft. A large amount of literature has been disseminated about the necessity of continuing the training of pilot graduates of the U. S. Army Aviation School after assignment to a field unit. Just as important, but less publicized, is the training of the other important half of the Army Aviation team: the mechanic.

The problem of obtaining and properly training replacements is a constant problem for the unit aircraft maintenance officer. There are two ways to meet this demand. The easiest way is to tell your line chief to keep an eye on the new man and make sure he learns what's going on. This type of training may not suffice however when the new man must take over as crew chief of an aircraft. Your service platoon may also find itself badly understaffed if the people do not progress in their training from crew chief to the more specialized and demanding work of the service platoon. It is apparent, therefore, that we should set up a definite and standardized unit training program which will produce the type of mechanic that every pilot wants to have working on his aircraft.

There is little question that we must have this training program. Now how do we set it up? That, of course, will depend upon your individual unit and situation. We will attempt to clarify some of the objectives and problems which will be common to any type of program and any unit.

The first step in setting up this program is to establish an over-all objective. In this case, we would like to turn out a competent, professional mechanic who can carry out his duties in the field or in garrison with a minimum of downtime on the aircraft, and with a minimum of supervision by the maintenance officer when a platoon is operating way off by itself.

The second step is to classify the stages of training of the mechanics within the unit. Normally, there will be four general levels of training in most units of aviation company size. These are the completely

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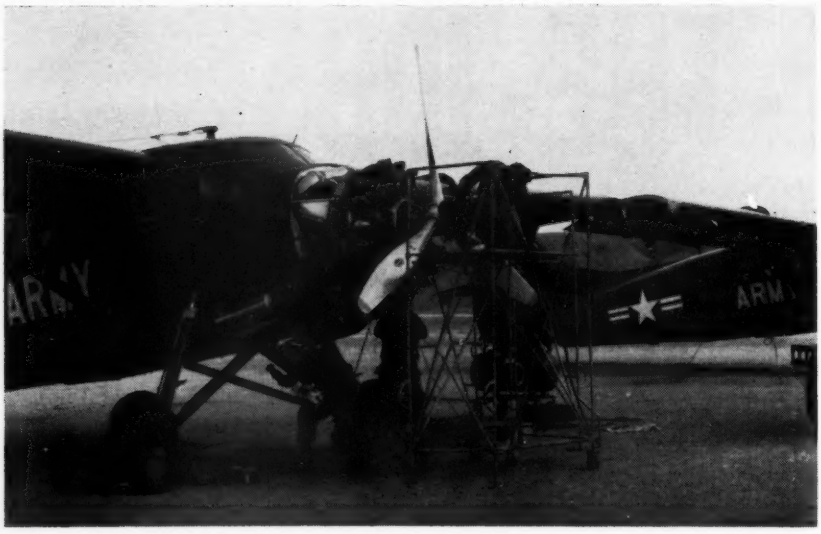


A competent, professional mechanic can be turned out through OJT

inexperienced men assigned for OJT (on-the-job-training) in a 670 MOS; the graduate of the basic maintenance (670 course) at the Aviation School; the graduate of one of the various advanced maintenance courses; and the experienced mechanic who has the capacity to increase his proficiency and is due for advancement to a more complex aircraft or a more specialized job.

After comparing what we have and what we would like to have, let's determine what we have been doing about it. This third factor in a unit training program is the level of training currently being carried on in the unit. Any unit, no matter how small or how complacent, has some maintenance going on, even if it isn't apparent. This type will not be of much assistance in setting up a program, but it will require that you evaluate the level of skill quite closely. If a systematic program is in operation, but which is not producing desired results within the time limits necessary, portions of this program could be worked into the new system. In any case, it is important that the people be picked up at the appropriate level to assure that they do not lose interest in the program.

The next point to be considered is the method of training which will be utilized. The available methods of instruction are service schools, unit schools, OJT, and conferences. In this case, we will be primarily concerned with supplementing the training which our people receive at the service school. In doing so, it will be necessary to use a combination of the other three methods. Here, it is wise to look on the whole program as on-the-job-training, supplemented by lectures and conferences. The actual OJT work, of course, will be carried on by grouping the beginners with the experienced hands, and keeping both under close supervision. Very seldom will you have enough time, equipment, or personnel **not** to use OJT to help maintain flyable aircraft. The most training value will be realized by using conferences and lectures to back up the actual work on the aircraft.

Another problem is obtaining qualified instructors. Here we have several sources. You may utilize yourself, your supervisory NCOs, specialists from the supporting field maintenance, and other pilots in the unit. By brushing up on what they learned in flight school, the pilots may be quite proficient in teaching basic aircraft systems, and in the process, they will become familiar with some of your problems. For the more advanced phase, the mobile training teams provided by the Transportation Supply and Maintenance Command are often available. These teams are classified according to type of aircraft.

Another factor which must be considered before we can set up a program is the expected length of the man's tour of duty in the unit. The same length of time could not be devoted to training in Korea as could be utilized in CONUS. In addition, the type or types of aircraft in use will have considerable bearing on the type and amount of training being carried on. Your program in a unit comprised of L-19s and H-13s will be different from one made up of H-21s.

With the preceding factors in mind, a definite program of instruction can be set up. For our purpose here, the aviation company will be considered a standard unit. In it we will find mechanics at all levels of training and proficiency, a necessity for performing maintenance at levels up to and **sometimes** including limited 3rd echelon, and several different types of aircraft, varying in complexity from the L-19 to

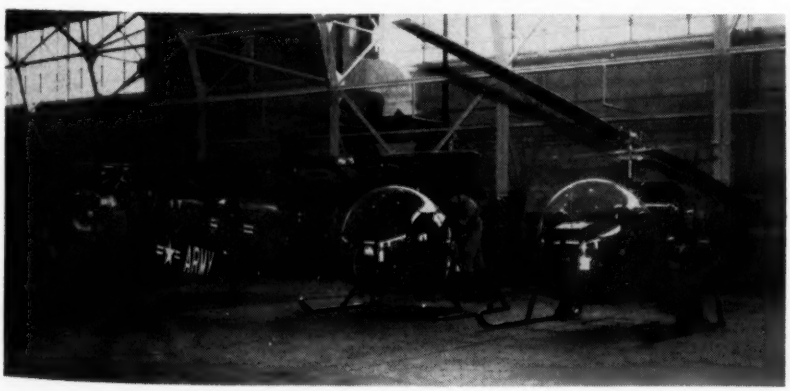
the H-34. To provide appropriate training, we can divide our course of instruction into four phases.

The first phase of instruction will be devoted to the beginners. These are the people who have no previous experience in aircraft maintenance and are working toward a 670 MOS. In this phase, much of the instruction will be by conference and lecture to rapidly give the student as much groundwork as possible in a minimum length of time. It is in this first phase that we will be primarily concerned with the basic systems of aircraft in general, such as electrical, fuel, hydraulic, and flight controls. There should be an introduction to tech manuals and other publications pertinent to aviation and the mechanic's job, along with a great amount of practical work on forms and records. We should aim primarily at familiarizing the students with the basic principles and functioning of each system.

In this phase, you may deem it wise to have all of your mechanics attend certain of the classes, as a refresher-type training. The amount of time spent on this phase will vary from unit to unit depending on many things, such as the number of people in this phase, and the rapidity with which they learn. As the administrator of this program, you can be very flexible. By watching the progress of the students closely, you can avoid wasting time on any subject which is picked up quickly. The instructors for this phase should be yourself, your supervisory NCOs, and other pilots in the unit, with the work spread out to make it less of a load on any individual.

The second phase of the course will involve more advanced instruction in such subjects as troubleshooting, operational checks, rigging, inspections, and to supply procedures and publications. For this phase of instruction, our students will be those who have finished the first phase, the newly assigned 670 graduate of the Aviation School and, for certain subjects, all your mechanics. This phase is best carried out with a minimum length of time on formal instruction and more time spent in actually working on the aircraft in groups, and by pairing each trainee with an experienced man in accepted OJT fashion.

A good mechanic may not be a good instructor



It is during this second phase of the program that we may begin to aim the student toward either fixed or rotary wing aircraft. Regardless of which he is slated for, however, enough instruction should be given on both to make him thoroughly familiar with each so that transfers at a later date are easier. This will forestall the situation arising in which we have a surplus of 671s and a shortage of 672s. This phase is best taught by you or your supervisory NCOs with the assistance of your unit's best qualified mechanics.

In the third phase of instruction, separate schedules will have to be maintained for the different classifications of mechanics. For the beginners, who by now should be fully qualified as 670s, assignment to a section as assistant crew chief with your most capable and proficient mechanics is the appropriate step. In utilizing the pupil-coach method for these people, details of the job begin to fall in place for the budding mechanic, and his proficiency increases rapidly. A point to watch at this stage is the status of the instructor-mechanic. A person who, with very close supervision, is a good mechanic may not be the correct one to use as instructor. The fewer bad habits which are built into the mechanic-trainee, the better.

In conjunction with this actual aircraft work, a closely supervised program of publications reading assignments should be carried out. For these students, as well as the more advanced mechanics, instruction should be presented on new developments in maintenance, procedures, sup-

ply, and advanced technical aspects of aircraft maintenance, as well as instruction on functioning of the unit under different conditions of weather, terrain, and facilities. This phase will necessarily be taught by your best qualified people, and by obtaining specialists from the field maintenance for instruction on selected subjects. The instructional teams from TSMC should also be used for information on individual types of aircraft; they possess the latest information on their particular aircraft.

At this point, if you have utilized all the facilities for training available to you, and have set up a functioning school, you should see definite results from your efforts. Those people who began with no experience should be well on their way to becoming qualified mechanics. Those who began as 670s should be qualified for the awarding of 671 or 672 MOS; they should be capable of safely taking over the job of crew chief of an aircraft, even while it is out of your immediate supervision. Those people previously qualified as mechanics should be in a very good position to advance to partly supervisory jobs, or to more complex aircraft as they are needed. Either of those choices adds a tremendous amount of incentive to being a mechanic and makes your training program of much more interest to the students as they begin to see the concrete results of it.

The "fly in the soup" now shows up as the irregular flow of replacements which is common to all organizations. By the time the first program is completed, a few more new men have arrived, and it is necessary to start over again. Your first phase must be flexible enough to take care of this irregular input and finish up reasonably large groups for advancement. Usually it will be necessary to maintain only one group at any given time in each phase except the last, to avoid taking up too much time in training. In addition, the material covered in the third phase will, to a large extent, be of continuing interest to your mechanics; a large part will be new material each time.

The maintenance function of any aviation unit will best operate at maximum efficiency with a definite and standardized training program. Exactly what this program consists of and how it is set up will have to be determined by the maintenance officer. Just keep in mind that unless you can ask any man in your organization if his aircraft is ready to fly, and depend on the answer, you're overdue to set up a good maintenance training program.

AN ARMY AVIATOR on a cross-country flight lands at a civilian airport (where no military maintenance personnel are available) with a defective left magneto. A civilian mechanic removes the magneto and replaces the points. The Status Today column (9) showed a red diagonal at the start of the flight. What entry or entries should the pilot make in the Form 781-2?

☐ Enter the discrepancy in Pilot's and Mechanic's Remarks column (26). Place a red X in the Symbols column (25) and in the Status Today column (9). After completion of the repairs change the red X to a red diagonal and sign the Exceptional Release column (10) and the Signature column (28).

☐ Enter the discrepancy in Pilot's and Mechanic's Remarks column (26). After completion of the repairs, place corrective action taken in the Corrective Action column and sign the Exceptional Release.

☐ Make no entries.

☐ Enter the discrepancy in column 26, enter corrective action in column 27, time for repairs in column 27a, and the pilot's signature in column 28. Enter a red dash in columns 9 and 25 and sign the Exceptional Release.

The recommended solution to the PUZZLER may be found on Page 18.

Ground Loop Anthology

Owen W. Lazenby

LIKE SPOON RIVER, the ground loop story has many tributaries and one must wind his way meticulously through the pages of history to find a source. I fondly recall reading of one event that dates back to the castor oil era of 1917 when an attempt was made to depart from the conventional by installing a tail wheel on an old Sopwith Camel. The object of the experiment was to find a way to eliminate the horrible gashes in the greensward made by the ruthless skids. When the narrow wheels of an aircraft struck one of those ruts on either takeoff or landing, a crash was almost inevitable and was decisively a deterrent to Britain's war effort.

The test pilot selected was a seasoned old hand of 1 hour and 20 minutes of solo exposure, having successfully performed 5 previous landings on the skids. The area selected was a perfectly smooth surface and, as is the wont of such auspicious occasions, all went well until the crucial moment. The touchdown was made in a slight drift to the right, which caused the machine to swerve to the left immediately. The brave pilot, already holding full right rudder, felt his only recourse was to his trusty engine and hit his blimp button. The incomparable system of nine castor oil jugs rotated into full power and, adding impetus to the impetus, spun the old Sop like a top.

When the debris had settled down over the Lincolnshire landscape, the fearless pilot extricated himself from the mess and remarked that it had been a pukka landing and he simply couldn't understand how the bloody kite had got away from him. The solemn crash crew gathered together all the little pieces and returned sadly to the hangar, with the chief honcho still insisting that it had been a jolly good idea.

Meanwhile, back at the ranch, the staid old Jennys were grinding their wingtips off faster than replacements could be manufactured. Every training field had at least one hangar piled up with JN wings waiting to be operated on by the carpenters and seamstresses. The narrow landing gear of the Jenny and the elasticity of the bungee cord permitted the old bird to teeter-totter to the extent that the slightest deviation from perfect directional control would smash the wingtips into the ground.

Wing skids were installed and they were smashed. A nose skid that was mounted to the gear and protruded beyond the propeller at a distance of about three inches above the ground was later devised. It was intended to stop the noseovers that were smashing up the expensive handmade propellers, but it was effective in only mild cases. A good old-fashioned ground loop in a 15-mile crosswind would snap the skid like a toothpick, and the lower wing would crumple; she'd go over on her back, or else stand proudly on her nose like an acrobat in a grand finale.

Commanders of aviation installations, themselves totally devoid of airplane experience, became frustrated. At one flying field a new commander, recently transferred from the Cavalry, rode his horse down the flight line on an inspection tour. Observing the heap of crippled aircraft in one hangar, he wanted to know why. When told that they had been damaged as a result of bad landings, he remarked sternly that he would fix that; then he rode

Ground loops rise in proportion to student load

back to the office in a full gallop and issued an order that there would be no more bad landings.

WORLD WAR I PROBLEMS

Of course, such action borders on the ludicrous, but by way of justification we must consider the plight of the commander of an installation full of flying machines that were being clobbered daily at a breathtaking rate. He had no precedent upon which to establish corrective action. No one had thought to make an analysis of landing type accidents to determine who had them, why, and how much experience the student had at the time.

As we look back into the dim days of World War I, we see that training continued against staggering odds; students became veterans in a few short months, and the Allied pilots regained control of the European war skies. Accidents meant that many students never became pilots. That causes us to ask: "Where did most of these accidents occur?" In the training schools. "Into what category did most of these accidents fall?" Landing type; and that can be boiled down to about fifty-fifty hard landing and loss of directional control. "Into what pilot classification did most of these accidents fall?" Student pilots.

When an accident occurs, it means that somebody failed to do something properly. So, with students having a rash of landing type accidents, it follows that they were not performing according to instructions; certainly this was not done deliberately, but because they were students. Due to a lack of experience, they were unable to react and execute in time to prevent the accident. By the time a pilot had progressed to the point of check out in a fighter or a two-seater, the chances that he would ground loop were very slight.

SEEKING A REMEDY

In seeking a corollary, let us hop back over the Atlantic and look in on a couple of flying fields picked at random: Greenfield in England, and Issoudon in France. Checkouts were being performed in SE5's and Spads with no sweat. The ground loops still belonged to the primary schools. The crates with the built-in twirl, created by the torque-producing rotaries, were gradually being replaced (early 1918) by the more stable aircraft with stationary engines. Thus ground loop occurrences among the combat pilots were being rapidly reduced to an all-time minimum.

THE 20'S AND 30'S

As we step into the pages of postwar history, we wave a fond farewell to the old surplus aircraft. The Jennys and Canucks and the Standards are falling in their tracks. Entering the glamour era of civil aviation are the new Travelaire, Swallow, Eagle and Waco. We should examine this tributary carefully, for the new infant aircraft industry, born here, grew and thrived despite a sickening economic depression. Within the span of a decade were produced the prototypes of our World War II military trainers, fighters, and transports.

Two popular 1930 models were the Great Lakes Trainer and the Waco F, which were supplied to civilian operators in generous quantities. Those used for the most part as primary student trainers sold a like quantity of wings and miscellaneous spare parts for the manufacturers. I remember one flying club operating a Great Lakes on my field that had at least one ground loop for each student soloed, but the older hands flew it for hours without a hitch. The F was the model that spawned the tailwheel, and I have a nostalgic recollection of it going around like a revolving door with a bewildered student la-

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Mr. Lazenby has been in Flying Safety at Camp Gary since November 1956. Most of his 30 years of flying has been spent instructing.

menting the fact that he had even thought of a flying career. However, I have either owned or flown almost every model Waco built and never gave a ground loop a second thought.

The good old stable Stearman stuck to the tail skid until in the '30s when it produced the first PT-13 for the Army Air Corps. Grand-scale training began in 1940, and the ground loop graph again rose in proportion to the number of students soloed.

WORLD WAR II PROBLEMS

Nineteen forty three marked my second year of instructing for the Air Corps, and I was aware of the terrific toll in Stearman wings incurred by the expansion program of that time. From the standpoint of economy, however, it was far better to have the ground loop experience on the less expensive Stearman than on the high priced AT-6 in the advanced schools, and the fighters in operational training. The concensus seemed to be, "Have your ground loops in Primary and get it over with!"

In a friendly discussion of the ground loop problem on one occasion, I had one advanced instructor grimly remark that insofar as the AT-6 was concerned, his greatest student bugaboo was directional control trouble. In rebuttal I cite one important fact: the students who completed the Primary phase in the PT-13 rarely encountered subsequent directional control difficulty in either the AT-6 or the contemporary high-torque fighters.

On the other hand, the students who learned to fly on the PT-19 and 23, both of which were direction - loving types, had extreme difficulty with the 6 and only a particularly adept few ever made it to the fighters. The accident rate in that group was higher and the elimination rate was greater. That, plus the strong similarity of directional control characteristics between the PT-17, AT-6, and the P-51 is exactly what led to standardization of the PT-17 (a somewhat improved version of the 13) as a primary trainer. The BT-13 was phased out and the 6 dropped back a notch to cover both Basic and Advanced.

The river broadens out as our course takes us past the World War II years. The Air Corps has become the Air Force. The jet age has brought with it the adoption of the tricycle gear so that directional control is no longer a problem. Always the emphasis is on speed and more speed; now the performance of the modern missile aircraft far exceeds the capabilities of mere man.

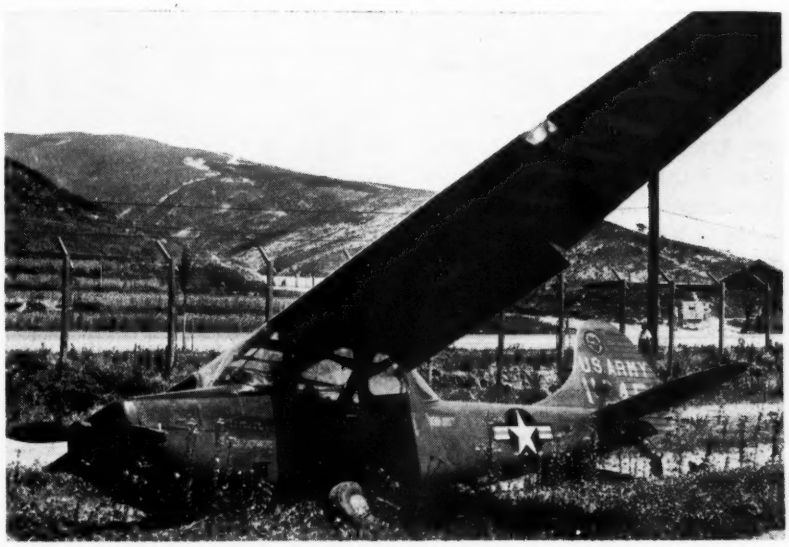
TODAY'S TRAINING

The modern Army, however, has a different flying job to do, one that can't be done in supersonic jets. It must have an aircraft that can seek out the enemy in his hiding places, one that can fly low and slow over the battlefield for reconnaissance and photography that can be taken back and evaluated quickly. The airplane selected for this job is the L-19, which the Army also uses for a primary trainer. There have been many arguments that some other type of trainer would be more satisfactory for Primary, one that does not have the potent ground loop tendencies of the L-19. However, the present system is a sensible one; for if it is the man's job to fly this aircraft, he might just as well be trained in it.

The L-19 is an aircraft that cannot be learned and understood quickly. Many hours are needed to attain real proficiency, so it would be silly to spend millions of dollars on some other type of trainer that would be, perhaps, easier for students to fly, but would still not qualify them for their future job so that millions more would have to be spent on transition.

For the third time in Army primary flying, ground loop history has repeated itself. The

Direction-loving types of aircraft aid and abet the ground loop



Cessna 180, of which the L-19 is a whittled down counterpart, has seen many hours of civilian flying. I could not begin to estimate the number of students and owners who have learned to fly it. Why is it, then, that nobody ground-loops it?

If I could organize a grand-scale experiment, I would take all those civilian operators and their students and put them into one big training program; I would place them under strict supervision and subject to the rigors of an intense course with only 12 hours to solo under pressure; and have them fly 12,000 to 15,000 hours per month. Then I'd sit back and watch the fireworks! It must be remembered that there are more ingredients in a ground loop than just the inherent tendency of the aircraft.

STATISTICS ARE REVEALING

The Flying Safety Office is often placed in the position of a dog chasing its tail. Because it must investigate and report all accidents, it has only intermittent spurts of accident prevention effort. Nevertheless, an accurate record of all the loss-of-directional-control type accidents holds a lot of useful information and, when put together, makes up a very interesting picture.

Camp Gary began Army primary training under the contractor, Wm. J. Graham & Son, in January 1957. To establish a basis for some statistics and comparison, we shall take the first 6 months period of 1957 and the 6 months period of 1958. During the first 6 months period of operations we experienced a total of 22 ground loops, 14 of which were solo, 8 dual. This indicates that the flight instructors had something to learn, too—not just how to control or prevent a ground loop, but a degree of tolerance or just how far they could let a student go. This period saw each successive class start until a full complement had been reached. The classes were fairly large and went through some high-time months, time total for the period being 83,603 hours. The 1958 period shows a total of 66,671 hours flown with 14 ground loops by solo students and 1 dual. The smaller number of hours flown for this period is due to the smaller classes in the latter part of the 1958 training period, although it is interesting to note that the number of solo ground loops remained unchanged.

The Bird Dog cannot be learned and understood quickly

CAUSE OR CURE?

As in some unexplained illness, when the poor patient is besieged with all sorts of remedies that will supposedly cure his ills, the medicine men begin to expound their theories. Some of these witch doctor propositions:

1. Ground loops occur when there is a calm. When the speed decreases during the landing roll the pressure is reduced on the control surfaces to such an extent that the rudder becomes ineffective and directional control is easily lost. Therefore, if a student shows ground loop tendencies, hold him off or shuffle him around so that he can solo under normal wind conditions! We looked up the figures and came up with the following tabulation:

CALM TO 5 KNOTS
9 cases

5 TO 10 KNOTS (NORMAL)
17 cases

2. Ground loops occur during the hot summer months. High temperatures mean that the air is thin; consequently, there is less pressure on the rudder and elevators. Such lack of control response makes directional control very difficult:

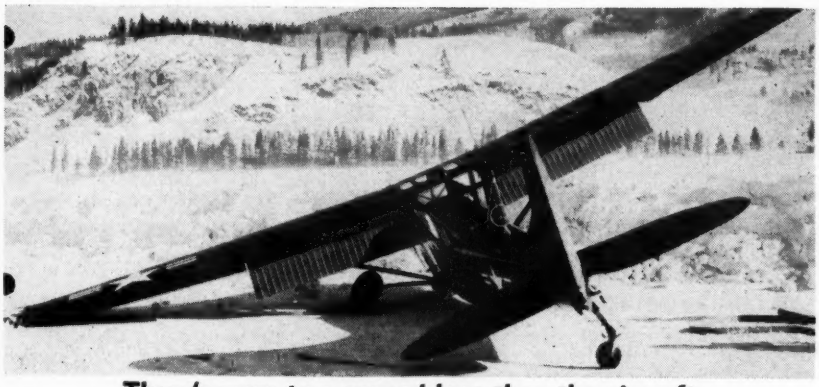
AUGUST
(hottest month of year)
5 cases

FEBRUARY
(Coldest month of year)
5 cases

3. Ground loops occur during the last period of the training day when both solo students and instructor pilots have had a lot of hard flying. Students returning to the home field in that last period should be advised to use extreme caution and remain particularly alert during the landing!

A table of hourly aircraft

accident occurrences revealed that 16 accidents occurred during the 0900 to 1000 hour period against 1 occurrence in the last period. In the afternoon flight 13 accidents occurred in the 1500 to 1600 hour period against 7 in the last period. All that it tells us with any reasonable degree of certainty is that accidents occur during flying hours. One important fact stands out, however, the peak hours just mentioned proved to be the times when the stage fields were at peak activity! So much for the witch doctors.



There's more to a ground loop than the aircraft

PINPOINTING THE CAUSE

In the approach to the solution of any accident problem, we must travel on the hypothesis that there is a reason for it in the first place. So first of all we set up the grand total of all our accidents, then broke them down. Ninety-one percent of them were ground loops. A further breakdown revealed that 83 percent of the ground loops occurred to students during their first 3 hours of solo. Now, in 40 representative cases of loss-of-directional-control accidents, we find some causes. The prime factor in the solo ground loop at the 3-hour experience level is the student's inability to cope with a situation which is entirely strange to him. He has not yet learned the deft movement of the controls, which we call technique, necessary in taking corrective action against an incipient ground loop. So, for him to do a normal job, all other factors and conditions must also be normal. Some conditions aiding and abetting the student's inability are these:

1. unfavorable wind,
2. fatigue (remaining in the cockpit for extended periods without a break),
3. emotional stress,
4. premature solo or solo under pressure because the class is behind schedule.

There are many cases in this representative group in which the student lost directional control because he committed a wrong act or failed to act at all. As far as origin is concerned there are two types of ground loops:

1. those that start immediately upon touchdown due to a drifting or crabbing condition during the round-out; and
2. those that start during the landing roll due to poor directional control technique on the part of of the pilot.

In both cases it is the lack of ability of the pilot to determine whether or not he is, and remains, properly lined up with the runway.

First three hours of solo account for most of these accidents

SOLUTION . . . ?

There are three strong factors which affect the student's ability to withstand or overcome ground loop susceptibility:

1. the quality of instructtion offered by the IP,
2. the student's ability to absorb that instruction,
3. the degree to which the student can carry out that instruction.

Thus, with the Utopian concept that our perfect students receive our flawless instruction and learn to fly under ideal conditions, we find our camp rid of the ground loop plague. Having analyzed the problem, we shoo the patient out of the office and lie back on the couch ourselves, feeling that we have the situation well in. . . . OOPS! There goes another one!!

•Number Six of a Series

ICE FOLLIES

A Survival Saga Of Greenland's Icecap

THE NORTHWESTERN AREA of Greenland is characterized by broad round bays, peninsulas, and islands. On the whole the topographic form here is that of a peneplain rising to 7,000 feet or more. The snowlines on the icecap rise inland to heights above 5,000 feet. Temperatures in winter range down to -50°F. (temperatures average 0°F. many months of the year) and high, gale-force winds are not uncommon.

These conditions set the stage for "whiteout," an atmospheric and surface condition in the Arctic in which no object casts a shadow. The horizon is indiscernible, and only dark objects can be seen. Also called "milky weather," whiteout is brought on when snow cover is complete and the clouds are so thick and uniform that light reflected by snow is about the same intensity as the light of the sun passing through the clouds. This inhospitable locale is the setting for a successful survival story—a saga of excitement, frustration, initiative, ingenuity, and rescue.

At 1130 hours on a July morning in typical icecap weather, two Beavers departed on a routine operational mission. Their destination was a nameless spot on the icecap 220 miles eastward. On board one aircraft were an Army pilot, two civilians, and an Army officer making his first trip to the icecap. Our story concerns this group whose aircraft was demolished in an accident. Let's pick up the story from the pilot's statement:

WHITEOUT!

"At approximately Mile 165 on the trail, which we were following for navigation, visibility suddenly dropped considerably. I contacted the pilot of the other Beaver by radio, and we decided to turn around and return to base. During a 180° turn to the left, the plane entered a 'whiteout' condition, and I lost all reference to the ground and the trail. I immediately went on instruments and rolled out of the left turn. During this turn, the aircraft began to lose altitude. Due to the high altitude of the icecap at this point and the low power available in the Beaver, I was unable to rapidly check the descent, so I concentrated on holding the aircraft in a level attitude. A few seconds later we crashed into the icecap. The time was about 1335 hours.

"The next thing I remember is turning off the switches and the gas selector valve and crawling out of the wreckage and firing a flare in the direction of the other Beaver, which I could hear overhead. Then I immediately checked the passengers and found that one of the civilians had no feeling in his left arm and that the other civilian had a sprained ankle. The Army officer did not appear to have any injuries. I had lacerations of the lips and two broken front teeth. We wrapped a parachute around the man with the broken arm and decided to leave him in the plane, since we were uncertain of his injuries. Then the officer and I opened two parachutes and put them on the trail, marking our location. Next, we took stock of our food and medical supplies and prepared coffee. Since we were not certain of immediate rescue,

Visibility suddenly dropped considerably

we decided to construct a snowhouse for a more permanent stay; this consumed most of our next five hours. At approximately 1830 hours an engineer swing arrived and relayed a message to the base reporting the accident. Two Chickasaws arrived at approximately 2230 and evacuated the injured to base."

In the terse language of official statements, much of the drama of an incident is necessarily omitted.

One of the survivors states that the pilot had seemingly regained control of the aircraft when they struck the surface of the icecap. At the time of impact the rate of angle was just such that the aircraft plowed into the snow for about 50 feet without the tendency to cartwheel; yet the force was not great enough to cause the fuselage to collapse. Under the force of impact, the skis and main gear folded backward and out, and both wings collapsed forward.

Another survivor's reaction to the actual crash "was one of seeing the snow, hearing the rending of the structure and realizing that we were remaining intact. Then the deceleration must have really taken hold and I found myself with head thrust between the forward seat and the side of the fuselage. It is possible that I blacked out for an instant, but I don't think so. I shook my head to clear it, looked out and the others were moving. I had been wearing a pile cap, which I'm sure softened the blow; it was still where my head had been. I struggled to my feet, as did the others, and it was then I realized that my left arm was dangling free. Later, the break was found between the shoulder and the elbow."

All the occupants immediately left the aircraft and kept away from it until all danger of explosion had passed. All had to exit through the left door because the right one had been jammed on impact. There was no panic. Once out on the snow they checked each other for injuries.

FIRST AID APPLIED

The pilot had cut the switches before scrambling out of the aircraft, an action that minimized the danger of explosion and fire. When it became evident that this danger had passed, they returned to the aircraft and broke out survival gear and first aid kits. The first thing to do was take care of the injuries. First aid was applied to the minor cuts, and the broken arm was tied snugly against the man's body with a rope. While the pilot took the Very pistol and fired several rounds of flares into the air, the other officer and civilian took care of the man with the broken arm. They put his parka on him and then wrapped him in a parachute, making him as warm, dry and comfortable as possible inside the aircraft.

The temperature at the time

. . . as the aircraft entered a "whiteout" during a 180° turn . . .

of the accident was not extremely cold; therefore, none of the survivors were wearing heavy Arctic clothing. However, late in the day the temperature frequently plunges sharply downward. The survivors agreed that immediate rescue was improbable and that a more permanent shelter should be started. They broke open two more parachutes and placed them along the trail to mark their location. Since it was evident that the Beaver could not be heated adequately with meager supply of canned heat, the three men "turned to" on a snowhouse.

In the two survival kits they found two snow saws, two cans of gelatin alcohol, rations, a gun, and other odds and ends. What a disappointment to discover there was no entrenching tool for digging in the snow. This they overcame by using broken pieces of the windshield. There was no container for melting snow or ice for drinking water or for cooking purposes. They solved this by using a ration can ¾ inch deep, 5 inches wide and 8 inches long. It was a long and tedious job to melt ice and snow and make coffee. Each can of gelatin alcohol would last just long enough to melt about 8 ounces of snow! The gun worked all right, but someone had removed the ammunition! Fortunately, it was not needed. As they labored slowly to build the snowhouse, they made frequent checks on the injured man in the Beaver. At one point excitement reigned when a S-16 was heard in the distance. The pilot fired the Very pistol, but the flares were not seen. It took the three men (one was hampered with a sprained ankle) five hours to complete the snowhouse.

HELP ARRIVES

About 20 minutes after they had finished the house, the cat train which they had passed over at Mile 145 arrived. It had taken the train almost 6 hours to travel 20 miles! On board the cat train were supplies, clothing, and blankets to make all the survivors dry and comfortable. More important however, was the radio that they used to contact the base. Eventually two helicopters evacuated the men to safety.

The chances of surviving under any circumstances in the Arctic are largely determined by the amount of forethought given to such a contingency. It is virtually impossible for a man to live if he is isolated with nothing more than his clothing. His life expectancy is in direct proportion to the amount of proper equipment he has with him and his "know-how." The problems associated with living through the period prior to rescue can be minimized by having planned properly for such an incident, and by using available equipment to its maximum capacity. Some important survival points are: Don't leave the aircraft, apply common sense, keep warm and dry, don't overexert, and above all, don't give up hope.

TRAINING PAYS OFF

Most accident victims suffer considerable shock, oftentimes without being aware of the fact. In such cases, as in battle, men tend to do what they have been trained to do. Where training is thorough and continuous, the chances for survival are increased. The pilot of this aircraft stated that he had received several indoctrination flights on the icecap and had heard discussions of past Arctic flying experiences. This was borne out by his reactions immediately upon making contact with the ground and subsequent reactions after realizing that rescue was not imminent. The two most important attributes an individual can

Broken windshield was used as entrenching tool

possess, aside from positive knowledge, are ingenuity and a well-balanced mind. Often isolation, loneliness, and fear can panic men who would not yield to stress under different circumstances. With peace of mind and ingenuity, many problems can be solved that will permit personnel to survive until help arrives.

Even with training and the above attributes, survival is difficult unless proper clothing, food, and equipment are available. In most cases, the using agencies and personnel are completely dependent upon supply agencies in the United States furnishing the needed items.

True, in preflight inspections, crews are supposed to make certain that all items are aboard before takeoff. The cases in which suffering was intensified by lack of any, or suitable, survival items constitute the majority of all survival stories.

RECOMMENDATIONS

The following recommendations pertaining to survival equipment, training, and aircraft design were made by the survivors of this accident and by the Board of Aircraft Accident Research:

1. All fixed wing aircraft pilots assigned to duty in Arctic or sub-Arctic areas be instrument qualified.

2. All fixed wing aircraft utilized in Arctic or sub-Arctic areas be equipped with the best navigational instruments available.

3. The use of rotary wing aircraft in lieu of fixed wing aircraft in Arctic and sub-Arctic areas be the subject of a comprehensive study.

4. A survival kit realistic in content and adequate to the requirements of Arctic conditions be made available immediately.

Specific recommendations relative to the survival kit:

1. Each kit contained only one can of gelatin alcohol, which was definitely inadequate. Experience of this group indicates that a can will melt only about 8 ounces of snow. More canned heat should be provided.

2. The kits contained no suitable container for melting snow. A container that will fit over the canned heat stoves should be provided.

3. Each kit should contain a rubberized ground cloth which could be used to prevent snow melted by body heat from saturating clothing and sleeping bags. Such a cloth could also be used as a signal panel.

4. If any member of this group had been pinned in the aircraft, it would have been almost impossible to release him since no tool was provided for prying or cutting. Tests should be made of the feasibility of providing the back of the snow saw with very fine teeth similar to those of a hack saw. This would be sufficient for cutting aluminum structural members.

5. The firearm left in the aircraft was operational, but the ammunition was missing.

6. Several duds in the flares were encountered when fired from the Very pistol. The shells fired, but the flares failed to ignite. It would be prudent to renew periodically the pyrotechnics in these kits.

7. While the food in the kits was edible, better foods should be made available.

Recommendations about the aircraft design:

1. Consider the possibility of including inertia reels for all passenger seats.

2. Possibly modify the L-20 aircraft so that the seats are attached to a more substantial part of the aircraft. (In this accident, the two forward seats were torn loose from the floorboards with pieces of floorboard attached to rear legs of the seats.)

STAY ALERT — STAY ALIVE

The factor behind the majority of cold weather casualties is carelessness. Frostbite, cold exposure, snow blindness, and carbon monoxide poisoning are four hazards peculiar to the Arctic area of operations. All can be prevented by alertness of the individual to their potential danger and by the use of the simple precautions against them. A man who is rendered ineffective from any of these conditions usually is negligent, or has not been given proper instruction. Serious injury and death are usually associated with foolish bravado, disregard of the cold weather dangers, or ignorance of survival procedures.

Emergencies sharply reveal the degree of professionalism in a pilot. How does he use proper equipment, facilities, and procedures? Does he maintain air discipline? Does he get crew and/or passenger coordination? Does he assume responsibility and leadership? Affirmative answers reflect a high degree of flying proficiency. They give added assurance that a pilot could accomplish his mission, even under the unusual, hazardous, and unpredictable weather conditions inherent with flying operations on the icecap of Greenland. Will you be a member of the next Ice Follies?

UHF

Major James H. Gooden, Sig C

FOR ARMY AVIATION the operation and use of UHF communication is a new problem. With the introduction of most new equipment, there is a period of time when the new gadget is not fully accepted by the operator, mainly because he knows less about it than previous equipment he has been using for years. It is therefore the purpose of this article to aid in shortening this period of so-called nonacceptance by explaining away some of the apparent mysteries of the What, Why, Where, and How Come of UHF communications.

Before one can use a piece of equipment to its best advantage, it is best to know just what it is. To better understand the capabilities and limitations of UHF, let's compare it and the radio spectrum in which it operates with something in the radio spectrum with which all pilots are familiar. We shall therefore choose first, the low-frequency band (low-frequency, four-course ranges); second, the standard broadcast band (3 minutes of music and 12 minutes of commercials); and third, the VHF (very high frequency) aeronautical communications band (where you find everybody on 126.18).

Starting at the bottom of the band we have the good old low-frequency ranges. The signals in this band are characterized by lots of noise, especially thunderstorms, and the capability of hugging the earth. As everybody knows the low-frequency signals can be received over the horizon, on ramp, behind the barn, or almost any place you happen to be. They are therefore non-line-of-sight.

The signals in the standard broadcast band generally have the same variable characteristics as those in the low-frequency band, but include, for navigation purposes, a real hooker; that is, they are bounced off various layers of upper atmosphere, especially at night. This serves to foul up the old automatic direction finder, since it receives a false signal coming from a point up in space rather than from the point to which you desire to fly.

As we go higher in the radio spectrum we find that the signals or radiation assume more and more the characteristics of light waves, which are line of sight. The correct term for radio signals is "radio line of sight" which may be received for a greater distance than that existing for visual line of sight. As radio frequency increases, the radio line of sight and visual line of sight gradually approach the same distance capability.

The VHF signals can be, and are, reflected. For example, a building or other object causes reception shadows. When you're behind the metal hangar you may not receive the tower; when airborne, if the landing gear or a wing gets in the way, you'll usually receive zilch. The two important points to be remembered here are that (1) there are only 360 channels available in the VHF band for use by aeronautical communications (118-136 MCS), and (2) these 360 channels belong to **civil** aviation worldwide, with military aircraft being temporary tenants in this band since it was first allocated for aeronautical communications use.

Now to the main point of the whole discussion, UHF. What does it mean and how does it act? To repeat, the letters UHF mean Ultra High Frequency. Since these signals are higher in the spectrum band than VHF, they have still more of the characteristics of light. In this band, if you're behind the hangar, you **won't** receive the tower. When flying, if a wing get in the way while trying to call jack rabbit approach control, things will get very quiet. So, dear readers and sky riders, try to transmit in level flight, or with the antenna pointed directly toward the ground station. With UHF also there are two things which you should remember: (1) There are 1750 channels avail-

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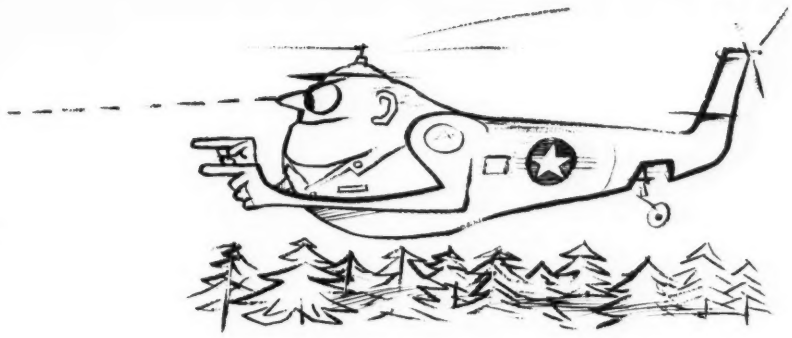
Major Gooden was with Aviation Surveillance, OCSigO when this article was written.

able in the UHF band (225-399.9 MCS) and (2) **every single one of them belongs to military aviation.**

Here, for the first time, Army Aviation has a tremendous communication capability far exceeding anything available before. Some of the do's, and don'ts, and suggestions for its use are presented.



Line of sight

INTERIM FREQUENCY ASSIGNMENTS

Some years ago when the VHF to UHF conversion pot started boiling, it was thought that common frequencies for common functions in the UHF band could be assigned in the CONUS and/or in major oversea areas on essentially the same basis as was used in the VHF band. As an illustration, using VHF at that time, a flight could be made from coast to coast in an aircraft equipped with 121.5, 126.18, 126.3 and 126.7 MCS only. This was possible because all the required communication functions were on common channels. All facilities had the emergency channel 121.5 MCS; all towers had 126.18 or 126.3 MCS; and en route stations could be contacted on 126.7 MCS. Things were a bit crowded at times, but it could be done.

Therefore, when the initial frequency assignments were made, all FAA towers were assigned 257.8, Air Force towers 236.6, Navy towers 233.8, and FAA en route stations 255.4 MCS. There were also other common channels, not pertinent to this discussion, such as common GCI and tactical as required. Cumulatively, these common frequencies comprised a group of channels for which switching was required in flight by the pilot. He had his choice of any channel from 1-20 and no more. The frequencies for each channel could be changed on the ground by a radio mechanic to take care of special tactical requirements, but the pilot could not change them in flight. He had access to 20 channels only, not 1750, which is the total available.

Military characteristics were then written for UHF airborne equipment based upon inflight selection of only 20 channels, and equipment development was started. Since the Army was faced with extremely critical space and weight limitations in its aircraft, it was decided that 8-channel equipment, because it was lighter and smaller, would suffice. Research and Development proceeded on a UHF set for the Army to the point of service test, but further development was cancelled because the set was not compatible with new frequency assignment requirements and plans which were approved at JCS level in 1953.

CURRENT FREQUENCY ASSIGNMENTS

As time passed it became clear that the original frequency assignment plan, utilizing common frequencies for like functions, was unsatisfactory. This unsatisfactory condition was brought about because of the tremendous increase in communication requirements and numbers of aircraft on the common channels. There were too many aircraft using the same channels for anyone to get in more than two consecutive words at most. Something had to be done. It was; and it goes something like this: All points and communication facilities, such as towers, approach control, GCA and en route stations were assigned what is called an "interference free" frequency. This means that no other facility within a radius of 750 miles uses this frequency, and no other facility within a radius of 500 miles uses either of the two adjacent channels. This system was agreed upon by all services and immediate implementation was started, is still continuing, and will not be completed until some future date.

But wait! What about all those USAF and USN aircraft currently in service which can select one of only 20 frequencies in flight? And what about those Army Bird Dog, Sioux, and Raven aircraft equipped with the AN/ARC-60 which

can select one of only 16 channels? With the implementation of the interference free frequency assignment plan, the tower at Fort Belvoir, Virginia, may be on 229.4 MCS while the tower at Fort Knox, Kentucky, is on 346.6 MCS. Under this plan then, a Bird Dog **might** contact Fort Belvoir but **could not** contact Fort Knox. The answer is this: the common channel assignment plan and the interference free channel assignment plan are **both** in effect now.

Both Fort Belvoir and Fort Knox and all other radio-equipped Army Airfields within CONUS are authorized, in addition to a common channel (241.0 MCS), an interference free channel. A civil airport example is Baltimore Friendship tower; it has the common tower channel of 257.8 MCS and also 360.8 MCS, which is **interference free.** When the plan is fully implemented, all facilities will have at least one, possibly more, interference free frequencies. The common channels **must also** be retained until all limited-channel capability aircraft equipment is phased out and replaced with suitable equipment with which the pilot can select any one of the 1750 UHF frequencies **while in flight.** All current production Army aircraft are being manufactured with UHF equipment (AM/ARC-55) which can select any of the 1750 UHF channels (with the exception of the VFR aircraft, the observation and reconnaissance airplanes and helicopters, which are too small to accept the AN/ARC-55).

Implementation of the interference free frequency assignment plan in the CONUS is a momentous task. It is a joint undertaking by the military services and FAA. At the outset, detailed plans were made, particularly with regard to the actual frequency to be assigned to each facility; but in reality, it remains to actually put the station on the air on the proposed frequency, try it, and then determine by actual operations if interference exists. Thus it can be seen that when a new requirement for an additional channel arises at a particular facility, its installation can force a change of frequencies at many other facilities.

HOW TO FIND THE INTERFERENCE FREE FREQUENCY

Because of this, assignment of clear channels or interference free frequencies for the many facilities in the CONUS is in a constant state of flux; it changes constantly and will continue to do so until some future date. Currently, the Army's flight information manuals TM 11-2557, Volumes 1, 2, and 3, list all common channels in the UHF band as well as **those interference free channels whose assignment is known to be firm.** Because of the constantly changing situation, many facilities with interference free frequencies are not listed. Eventually all will be listed.

If while in flight, the traffic becomes heavy on the common frequencies, and the interference free frequency for the facility is not listed in TM 11-2557, then the first transmission to the desired facility on the common channel should go something like this: "Podnuk tower, this is Army 67085. What is your clear UHF channel?" If they have one, they will tell you.

So from this discussion, these two things should be learned:

1. If you want to find a clear channel for a facility LOOK IN THE BOOK (TM 11-2557).
2. If it isn't in the book, ASK (on the common channel, of course).

FUTURE UHF AIRCRAFT EQUIPMENT

Neither the AN/ARC-55 nor the AN/ARC-60 meet the Army requirement as UHF aircraft equipment. The AN/ARC-55 is too heavy and current drain is too high. The AN/ARC-60 has a very low power output and a limited channel capability.

To offset these disadvantages, the Army and the Navy are participating in joint development of a lightweight UHF set which will be compatible with all Army aircraft in which UHF communication is required. This set, known as the AN/ARC-51, is being developed by Collins Radio Company under contract with the U. S. Navy. It will not be available until the early '60s. It is currently planned as a retrofit and production replacement for the AN/ARC-60 and a production **only** replacement for the AN/ARC-55. Design of this set is proceeding on schedule; but since it is a development set, its characteristics will be omitted here.

UHF GROUND ENVIRONMENT

What is it and where is it?

Many statements and questions have been overheard regarding the UHF communication program. Pilots frequently ask, "So who can I talk to?" Answering that question involves a description of the UHF ground environment.

UHF FREQUENCY DATA

Listed are some of the common channel assignments by function.

1. Army Control Towers	241.0 MCS
2. Air Force Control Towers	236.6 MCS
3. Navy Control Towers	233.8 MCS
4. FAA Control Towers	257.8 MCS
5. FAA Air Traffic Communications Stations	255.4 MCS
6. Emergency	243.0 MCS

NOTE: All U. S. Army aircraft, including VFR-only aircraft (observation airplanes and reconnaissance helicopters: Bird Dog, Sioux, and Raven), can net on any of the above common channels. So can all other Army aircraft when UHF equipped with the AN/ARC-55. However, the AN/ARC-55 has the capability of selection of any of the 1750 channels while in flight; therefore, ALL AN/ARC-55 EQUIPPED AIRCRAFT SHOULD USE CLEAR (INTERFERENCE FREE) CHANNELS SO AS TO MINIMIZE CONGESTION ON THE COMMON CHANNELS.

7. USAF Ground Control	275.8 MCS
8. FAA Ground Control	248.6 MCS
9. USAF Weather (Pilot to Forecaster Service)	344.6 MCS

NOTE: Only IFR Aircraft AN/ARC55 equipped can net on the above channels. This is a minor limitation that can be lived with until a suitable 1750 channel UHF set, sufficiently small for observation and reconnaissance aircraft, is available from Research and Development.

ANY FREQUENCY IN THE UHF BAND, LISTED ON THE FIRST FOLD OF THE AVIGATION CHART OR ON THE APPROACH CHART IN TM 11-2557, VOLUMES 1, 2 or 3, OTHER THAN SHOWN IN THE ABOVE 9 CATEGORIES IS AN INTERFERENCE FREE CHANNEL.

INTERIM EQUIPMENT CHARACTERISTICS

Listed below are a few of the principal characteristics of the interim UHF equipments selected for Army aircraft:

	AN/ARC-55	AN/ARC-60
Channels	1750	16*
Power Output	9 watts	.5 watt
Weight	Approx 60 lbs. plus cables	Approx 24 lbs. plus cables

UHF AIRCRAFT AND GROUND EQUIPMENTS

Installed in	L-20, L-23, U-1A, L-19, H-13, H-23, H-19, H-21, H-34 H-37

* *These 16 channels are limited to a small portion of the UHF band: 228-258 MCA. The common channels for most facilities, as listed on the front fold of the navigation chart in Volume 1 of TM 11-2557, fall within the frequency range of this equipment. These common channels do not require use of the 16 total which are available. Therefore, upon receipt of an AN/ARC-60 equipped aircraft, it will be noted that extra channel spaces are available. These extra channels can be used locally as required and the proper crystals should be requisitioned through normal supply channels. It is most important, however, that frequencies requested for local use must be in the 228-258 MCS band or they cannot be used by the AN/ARC-60 equipped aircraft.*

To state it briefly, the Army Aviator can contact on UHF anyone with whom radio communication is required. In the continental United States, Alaska, Hawaii, and other U .S. territories and possessions, UHF ground equipment is cosited with VHF ground equipment WHERE THERE IS A NECESSITY FOR MILITARY COMMUNICATIONS. This requirement for communication exists for UHF at practically every point that has a VHF capability.

It, of course, is the sum total of all UHF communication facilities operated by the military departments and FAA. Where there is a military requirement, the FAA operates UHF at:

a. towers,
b. approach control facilities,
c. GCA facilities,
d. ground control facilities,
e. air route traffic control centers,
f. air traffic communication stations.

The USAF and USN can communicate with Army aircraft from:

a. towers,
b. approach control facilities,
c. GCAs,
d. DFs,
e. air defense radar stations,
f. ground control intercept facilities.

At Army airfields, of course, there are UHF frequencies allocated for towers, Ground Control Approach facilities, and approach control as required. In the event your particular field does not have sufficient UHF frequencies assigned for the various functions you are required to perform, submit your request for the necessary equipment to the Post Signal Officer since the frequencies are

certainly available for the asking.

THE UHF PROBLEM IN EUROPE

As previously stated in these articles, UHF is the NATO standard for aeronautical communications. The countries comprising NATO have not progressed in the installation of UHF ground equipment to the same degree as the U. S. It is a fantastic economic burden on some of the countries of NATO to provide complete UHF coverage for low-altitude airway operation. Thus the situation in NATO countries is that, although they have agreed to UHF, today it does not in fact exist for low-altitude airways operation. The term "low altitude airways operation" is used to distinguish between the normal VFR and IFR operations associated with Army Aviation and the operations of the combat aircraft of the NATO Air Forces. It has been the policy in NATO UHF implementation to take first things first for installation of ground UHF equipment. High priority has been given to those facilities required for control of high-performance, high-altitude jet aircraft. In the normal operation of these aircraft, communication is not required with each en route facility which is to be overflown. The aircraft take off and climb to high altitude in a rigidly controlled control zone around the airfield and usually under GCI control. They then fly where they are required with complete disregard of airways operation, as we in the Army know it, and land at a controlled base similar to the point of departure.

Therefore, even though the aircraft of the USAF and other countries can fly in Europe with UHF, the Army cannot because of the difference in operational responsibilities. The low-altitude airways in NATO will have co-sited UHF in the near future, however, but progress is slow. In the meantime, since all aircraft of the Army are being produced with installed UHF, they, if destined for Europe, will continue to be processed through modification centers for re-installation of VHF equipments prior to departure. During such modification, the complete provisions for UHF equipment, including the necessary wiring, are left in the aircraft to permit simple and immediate installation of the UHF equipments when the need arises.

Attention: Army Aviators and Crew Chiefs

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Solution to Puzzler

On the basis of the factual information contained in the PUZZLER on page 4, the recommended solution is as follows:

Enter the discrepancy in column 26, enter corrective action in column 27, time for repairs in column 27a, and the pilot's signature in column 28. Enter a red dash in columns 9 and 25 and sign the Exceptional Release.

A red dash in column 25 indicates that an accessory has been removed and repaired and that an inspection by authorized maintenance personnel is necessary. Only certain maintenance personnel are authorized to initial corrected red dash items.

Reference TB/AVN-5 Para 20 and 57d.

All For One or One For All?

FOUR DIE IN FLAMING AUTO

(SPECIAL) — Four members of the freshman class at Carter University were killed last night when their car left the highway and struck a telephone pole 4 miles south of town.

Killed were Elizabeth Attley, 18; Jack Adams, 18; Ruth Brewer, 18; and Stacy Rivers, 19.

The car was a birthday gift to young Rivers, the driver. It had been delivered the day before. Highway patrolmen estimated the car was traveling in excess of 90 miles per hour when it left the highway.

Local court records revealed that Rivers had been arrested three times during the past year for speeding and reckless driving.

Exaggeration? Rare instance? This account was taken from a newspaper during the past 6 months. Only the names have been changed. Similar instances occur every day. If you doubt it, read your paper or listen to the newscasters.

What connection does this story have with Army Aviation?

ARMY AVIATOR SURVIVES BAILOUT, KILLED DURING NIGHT LANDING ATTEMPT

(SPECIAL) — An Army Aviator was killed last night when his aircraft crashed into trees during an attempted landing at an unlighted airfield.

Investigators told of a previous accident from which this aviator narrowly escaped death. The non-instrument rated aviator had been on a cross-country flight for which weather was given as a minimum 1,500-foot ceiling, with cloud tops at 12,000 feet, visibility 5 miles and freezing level 2,500 feet. He was told that a cold front lay adjacent to his route and was advised to monitor en route weather carefully.

After approximately 2 hours in the air, during which the aviator (by his own account) failed to contact en route radio stations for weather, he entered instrument flight conditions and began to climb. The climb carried the aircraft above freezing level and into suspected icing conditions. At 6,700 feet ice built up rapidly on the aircraft and the engine lost power; the aircraft began to descend and the engine stopped. The aviator bailed out and reached the ground unhurt.

Isolated case? Hardly —

COCKPIT CONFUSION

An instructor pilot was giving a combined transition and instrument check to an Army Aviator. The instructor was occupying the right seat, a position from which he could not reach the controls, and the aircraft was equipped with a single throwover control. During the flight, probably while performing unusual position maneuvers, the aircraft went out of control and spiraled into the ground. Both pilots were killed.

Checking into the record, we find that only a few months before, this instructor pilot had experienced a gear-up landing. He was giving dual instruction and had the student cycle the gear several times while entering traffic. In the resulting confusion, the student made his landing approach with the gear

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This article was prepared by the United States Army Board for Aviation Accident Research.

If preventive medicine helps save man . . .

retracted and the instructor pilot failed to note the condition until touchdown.

PREVENTIVE MEDICINE

For thousands of years, predating recorded history, man has practiced preventive medicine. Earliest man learned that cooked food not only tasted better, but was less likely to make him ill. During the years that followed, we have seen preventive medicine grow into one of the most important factors in conquering disease.

PREVENTIVE MAINTENANCE

Preventive maintenance is a proved and established practice for all types of machinery. This type of maintenance provides reliability, longer machine life and less time out for repairs. The Army uses preventive maintenance for all machines from typewriters, to automobiles, to aircraft. Savings in manpower and increase in efficiency have been tremendous.

PREVENTIVE DISCIPLINE?

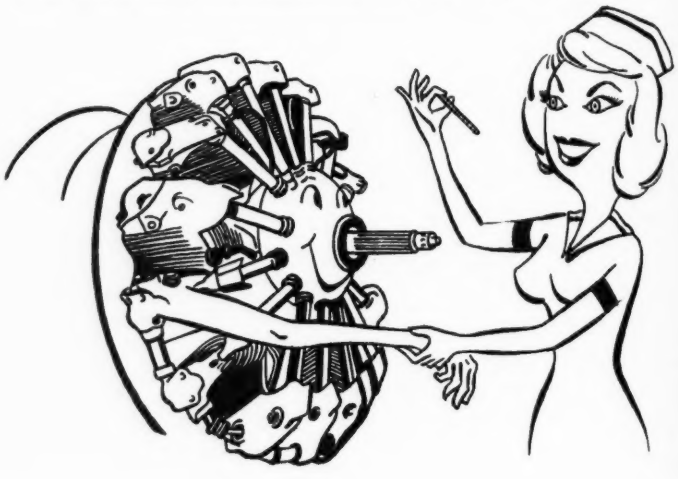
Before you conjure up the usual picture of some higher-ranking Simon Legree type wielding the whip, let's examine this word **discipline** and see what it really means. First, discipline is a branch of knowledge or learning; it is training that develops self-control, character, orderliness and efficiency. It is the result of training, self-control and orderly conduct. It is acceptance of and submission to authority and control. Last, and we emphasize **last**, discipline is treatment that punishes. In its accurate definition, discipline sheds those disagreeable meanings attributed to it through long misuse.

What is preventive discipline? Preventive discipline is before-the-fact discipline. It is training and treatment to correct those habits, traits and undesirable elements which may lead us into trouble. Only after-the-fact discipline is concerned with punishment. For the purpose of this article, we can dismiss after-the-fact discipline completely. It is a tragic but unalterable fact that dead aviators are subject to no type of discipline, before-the-fact or after. It is equally recognized that fear of punishment, used as a preventive measure, restricts and does not improve aviation.

MOTIVATION

To understand the need for

and preventive maintenance helps save machinery . . .



why not preventive discipline to save man and machinery?

preventive discipline, we must first understand what causes aviators to commit those acts of commission or omission which bring unnecessary hazards to flying. Psychiatrists tell us that men are creatures of motivation — motivated to eat when hungry, sleep when drowsy, and whistle at the opposite sex. These are simple, easily understood motivations, normal reactions to physical needs.

More complex and less predictable are mental motivations, arising from personality needs. We need group recognition. The noisiest youngster in the first grade may be the most lonely; the boy who does handstands on the beach may be attempting to overshadow his timid nature. Each is striving for group recognition and approval.

To juvenile minds, the flaunting of rules and laws is a mark of sophisticated maturity: the stolen watermelon tastes better because of its source; drag racing in a restricted area is more exciting. The prohibited cigarette or drink tastes far better only because it is prohibited.

Unfortunately, these characteristics do not always diminish with age. The man who rules his family with iron-willed, I-am-lord-of-the-manor intolerance is a good bet to have matured in age only.

Very few of us reach full maturity or remain completely childish. Our motivations stem from various degrees within these two extremes.

AGGRESSIVENESS

Aggressiveness is a character trait which the successful aviator candidate must possess to some degree; timidity has no place in aircraft cockpits. Yet, this very aggressiveness, if permitted to channel actions haphazardly, can destroy men and aircraft. Aggressiveness, to benefit military aviation, must be limited to individual ability and confined to missions to be performed.

The quarterback who hogs the ball and plays to the grandstand may be very aggressive, but his team will probably get the short end of the score. Another quarterback may be equally aggressive, but mix his plays and share ball-handling duties with other backs to keep the opposition off balance. One seeks individual recognition, the other team accomplishment. Which team would you bet on?

TEAM SPIRIT

Winning gridiron coaches don't limit their teams to a few simple plays because individual players can't perform correctly. They practice and scrimmage until every player is letter perfect in every play. Perhaps the most important single factor in the success of any team is team spirit. Without this spirit, the coach has 11 individual players, each traveling in a different direction. With it, he has a team capable of concerted action. It is the responsibility of the coach to motivate the players into group effort, rather than individual grandstanding. His most effective tool is the attitude of the group itself. Remember that the individualist is seeking group approval; denied this approval, through the "silent treatment" or ridicule of the group, he usually learns to channel his activities in the right direction.

Accident prevention, to be effective, cannot be a negative, flight-restricting, operations limiting program. Rather through training, correction, and practice every aviator should become letter perfect in each of his assigned roles. In addition, the successful aviation commander develops group spirit and high morale. The grandstand aviator who seeks group approval for exceeding his capabilities is corrected much faster when his actions arouse the disapproval of other aviators in his unit than the same aviator who is tolerated or looked up to as a "hot pilot."

There is no control over the individual who deliberately goes out and tries to clobber himself. He may do this because of ignorance, bullheadedness, overconfidence, or, as is too often the case, lack of command supervision and interest — here is where morale and group spirit are badly needed. How are yours?

Memo from Flight Surgeon

RECENTLY, AT AN Army installation, a pilot was involved in an aircraft accident which caused considerable damage to the aircraft. Fortunately, the pilot escaped serious injury. When first seen by the Flight Surgeon, the pilot was carrying a carbon monoxide saturation of over 15% in his bloodstream. Investigation revealed the pilot received this concentration AFTER the accident by waiting for an hour or so in a closed bus with the heater full open and by smoking several cigarettes in that time. This sequence of events could have been reversed. Abnormally high carbon monoxide levels could be obtained PRIOR to flight and can result in accidents.

Let's look for a moment at this substance called carbon monoxide. What is it? Where does it come from? How do we get it in the bloodstream? What does it do to us and how can we reduce the possibility of becoming a statistic due to its effects?

Carbon monoxide is a gas. In normally encountered concentrations, it is a colorless and odorless gas. It is formed by combustion of any carbon-containing material. Examples are gasoline engine exhausts, fumes produced by various types of heaters used in vehicles and dwellings, and from cigarette smoke. Inasmuch as it is a gas, it can be breathed and thereby absorbed into the bloodstream from the lungs. It acts in effect as a suffocating agent. It combines with that portion of the blood cells which normally combine with and transport oxygen. This prevents oxygen from being taken to the parts of the body where it is needed. The presence of CO in the bloodstream even causes the oxygen which is already being transported in the body to be liberated less freely. Both these phenomena tend to produce hypoxia. The affinity of the oxygen-carriers of the bloodstream (hemoglobin) for carbon monoxide is 200-300 times greater than its affinity for oxygen. Add to this the fact that the higher you go in the air, the less oxygen there is to compete with carbon monoxide and the more likely you are to develop symptoms.

One ever-present and constant source of carbon monoxide for many pilots is cigarette smoke. Most pilots who smoke do not realize that tobacco acts in a way similar to alcohol as far as elimination of the substance is concerned. Once carbon monoxide enters the bloodstream, it leaves very slowly. About half of it is still present after 6 hours and some may still be present after as long a period as 24 hours. Burning of tobacco puts certain amounts of CO in the smoke and some of it is absorbed whether you inhale or not. If you inhale, things are merely made easier for the gas since absorption is much greater from the lungs than through the mucous membranes of the oral cavity. If you are a steady smoker, a concentration of as high as 10-15% may be reached. Remember, it only takes approximately 4-5% concentration to produce impairment of certain physical functions such as visual acuity, depth perception, and altitude tolerance. Smoking one cigarette results in the saturation of about 1-1.5% of your hemoglobin with carbon monoxide instead of oxygen—and, if you have been smoking heavily or steadily, you probably already have enough carbon monoxide in your blood so that at an actual altitude of only 10,000 feet, your body reacts as if it were at 15,000 feet. At night, smoking three cigarettes in a relatively short period of time will reduce your night vision as much as the effects of 8,000 feet of altitude . . . and this is all before you even leave the ground. Not only are the oxygen requirements raised and blood carbon monoxide increased by smoking, but also depth perception can be appreciably impaired. A smoldering cigarette also produces ammonia, which adds insult to injury by irritating the eyes.

How do we recognize this carbon monoxide if it is odor-

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less and colorless? The best indication of possible contamination is by detecting unusual exhaust odors in the cockpit. Although CO is odorless, usually it is accompanied by substances which do have an odor and can be recognized. DO NOT RELY on the old check for red fingernail beds . . . by the time the nails have turned red, the pilot's senses are so dulled he can no longer recognize the seriousness of the situation, much less take corrective steps. Any odors of exhaust fumes or other unusual fumes or odors should be sufficient to cause suspicion and indicate to the pilot that he should switch to 100% oxygen, if available, and in all cases to abort the flight as rapidly as possible.

If the pilot does not detect fumes, but rather notes the onset of dull, throbbing headache, this is his cue. Throbbing headache is one of the most prominent symptoms of carbon monoxide poisoning and generally appears with concentrations of approximately 20%, although this varies from individual to individual (some individuals are affected with concentrations of even 10%). The insidious thing about CO is that there is a reduction in pilot efficiency at blood levels too low to produce symptoms recognizable to the pilot, such as headache. In addition, if the percentage of CO in air reaches 10%, a pilot with a normal rate and depth of respiration would achieve a concentration of carboxy-hemoglobin of over 20% in one hour. Concentrations in excess of 50% soon result in unconsciousness. For practical purposes, individuals are essentially helpless at concentrations somewhat below 50%. Add to these considerations the possibilities of excessive concentrations which could be produced by heavy preflight smoking an frequent inflight smoking . . . especially at night and at altitude, and even more especially at the end of a long flight when fatigue becomes a factor as does possible low blood sugar levels . . . all this at the most crucial period of a flight, i. e., the letdown, approach, and touchdown.

We can see how the pilot in the story might have had sequence of events reversed . . . how he could have waited for an hour or so in a poorly ventilated ready room or bus with heater going full blast, how he could have smoked several cigarettes in anticipation of a long or unusual mission and finally climbed aboard his aircraft with perhaps 15% carbon monoxide in his blood.

We can see how the pilot could have taken off, smoked in flight, perhaps received some exhaust fumes in the cockpit; how it became dark as he returned home after two or three hours in the air. He's tired, nervous, has a splitting headache, can't see as well as he should, is mentally below par with slower reaction time. He lines up on the runway, or where he thinks the runway lights seem to be, lets down . . . clobbers in and burns. The investigation may or may not show why.

The investigation may or may not reveal what really happened

FRIEND and ADVISOR to AVIATORS

Captain Archie W. Summers, Inf

TRUST IS THE key word for aviators thinking of, or dealing with, the Federal Aviation Agency. The FAA deserves our confidence because of its honesty, integrity, and reliability.

This agency exists only because aviators need its services. It is advisor, friend, protector, and monitor for all air machines. Advice is given freely, along with weather reports, winds aloft, terminal forecasts and in some remote areas, friendly conversation.

As a friend, the FAA is concerned mainly with your safety and well-being in flight. It protects aviators, especially those on instrument flight plans. Controllers protect your air space from all other aircraft and provide a reserve pocket of air for your entire flight.

The least pleasant duty of the FAA is to punish those who violate air regulations. **Thinking** aviators understand this necessity to protect the many from the few.

Mistakes by controllers? Certainly there have been mistakes. Any organization made up of human beings will sometimes "goof." The fact remains that one of the safest flights to make is an IFR flight with positive control by FAA personnel. Almost all mid-air collisions happen during daylight hours with one or both aircraft on VFR flight plans. Most bad weather accidents are caused by bad approaches, missed approaches, or severe weather — NOT because a controller made a mistake. On an IFR flight you are in very capable hands. THINK HARD before questioning their decisions; there are very good reasons for assigning the altitude or airway for your flight. Remember, you are not the only aircraft in the air.

The FAA is a new government agency only in title. Historically, the roots of FAA go back to 1926 when the first Air Commerce Act was passed. This act gave to the Assistant Secretary of Aeronautics in the Department of Commerce the power to regulate the new business of air transportation, license pilots, develop air navigation facilities, promote flying safety, map airways, and furnish flight information to those who need it. In 1934 all Air Mail contracts were cancelled and a congressional investigation was started.

The Air Mail Act of 1934 followed. From then until 1938, three separate federal agencies managed civil aviation: The Post Office Department awarded contracts and established routes; the Interstate Commerce Commission fixed the mail rates that the Post Office paid; and the Bureau of Air Commerce carried on the functions formerly handled by the Aeronautics Branch.

In 1934, also, a thorough study of commercial aviation was made by presidential direction and this led the way to the

Captain Summers is a Senior Army Aviator with more than 3,000 flying hours. He is fixed and rotary wing qualified.

writing of the Civil Aeronautics Act of 1938. Under this act the Civil Aeronautics Administration and the Civil Aeronautics Board came into being. In 1940 the act was amended in certain respects, but world events prevented a genuine overhaul.

In 1946 the President established the Air Coordinating Committee to "provide for the fullest development and coordination of the aviation policies and activities of Federal Agencies." In 1948 this committee noted that "existing techniques of air traffic control and tools available to CAA are marginal, even by pre-World War II standards."

Between 1948 and 1955 several commissions, presidential and congressional, made studies of aviation and its potentials as they might affect the future of the United States. A study begun in 1955 resulted in the recommendation in May 1957 that a Federal Aviation Agency be created. Mr. E. R. Quesada was appointed as the first administrator of the new Federal Aviation Agency.

The following agencies were brought together and now compose FAA: the Airways Modernization Board, the CAA, and the rule-making section of the CAB, complete with personnel, funds, and functions.

The FAA operates on a five-point plan described in the following principles:

1. To regulate air commerce to promote its development, safety, and requirements in national defense.

2. To control the navigable airspace and to regulate civil and MILITARY flight operation in the interests of safety and efficiency.

3. To develop and operate a common system of air traffic control and navigation, for both civilian and military aircraft.

4. To develop a plan for the Agency's function in the event of war.

5. To prescribe minimum standards for design, material, and workmanship in aircraft construction and construction of other elements of aviation.

For the first time in aviation history, legislation now assures coordination and cooperation between civil aviation and the military services. The Act also provides for assignment of military personnel to posts within the Agency.

By August or September 1959, there will be approximately 145 service personnel assigned to the FAA. The breakdown by services will be an approximate ratio of three Air Force, two Navy, one Army. As of 21 May 1959 there were 18 Army personnel assigned to the FAA. Fourteen of these 18 are Army Aviators.

The FAA exists solely for the use of aviation, civilian and military. It is your friend and advisor while you are in the air. KNOW IT; UNDERSTAND IT; USE IT.

IPSO FATSO . . .

Fred M. Montgomery

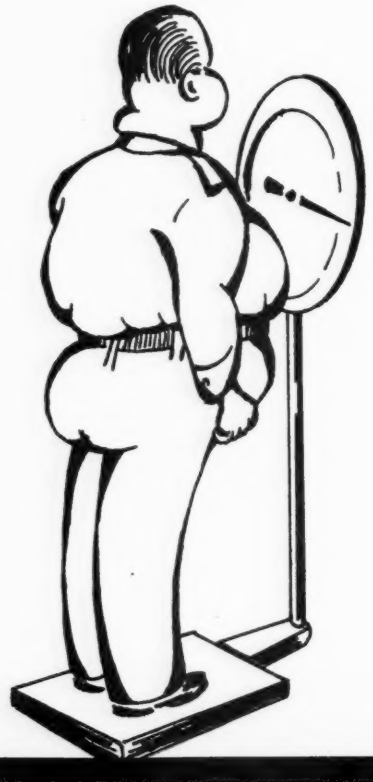
MAJOR U. R. PLUMPE was bouncing along happily toward the PX for his mid-morning coffee break. As he opened the door he met Colonel C. U. Laater, the flight surgeon.

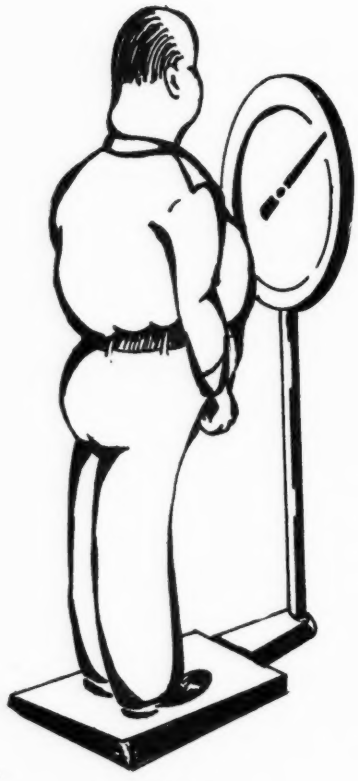
"Good morning, Sir!" greeted Major Plumpe.

"Ah, good morning, Major," replied the flight surgeon, as he glanced at the obviously overweight officer. "Say, Major, why don't you drop in to see me later today? There's something important I want to discuss with you."

A meek and somewhat perplexed major answered, "Why certainly, Sir. Will just before lunch be suitable?"

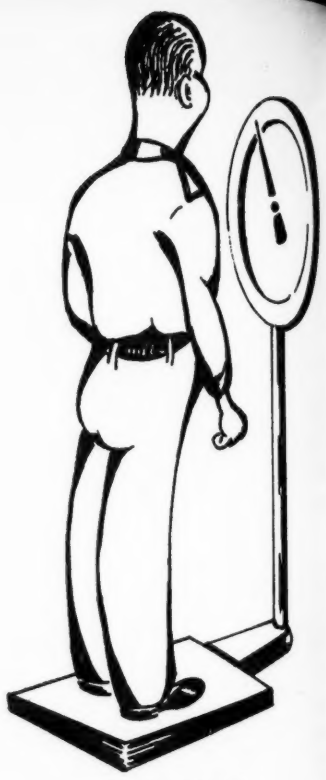
The only way . . .





to reduce . . .

Pensively, Major Plumpe wondered what the flight surgeon would have to say. Would he be grounded? Lose his flight pay? (Perish the thought! He had just bought a new home; the oldest child started school in October; a new deep freeze had made further inroads into an already tight budget.)



is eat less!

Would the doctor give him a grace period if he was overweight? Come to think of it, he had not stepped on the scales since his last physical examination. And the little woman was feeding him steaks and french fries with increasing regularity since the new freezer arrived.

Just what can an Army Aviator do about overweight? How can he tell when he is on the plus side? Is he supposed to starve? Take dozens of pills? Ugh! These and many similar questions raced through Major Plumpe's mind as his coffee grew lukewarm.

But, wait a minute. Managing your weight can be a painless, hardly necessary habit, or a perennial pain-in-the-appetite, depending on how easily you put on pounds. How much you tip the scales at any given time isn't a very good test of your weight managing job. The important consideration is the long-term job of control.

The usual procedure for

checking a long-term weight managing job is to use a performance graph or chart. That graph shows — production going up or scrap rate going down — what kind of control you have. Suppose you had a graph that shows your weight from teenage through the twenties and up to the present. What kind of managing job would it show?

If the graph or chart showed a steady increase in your weight from teenage until the present, even though it might have leveled off in your twenties, it indicates that you have not kept your eating under control. It's true that many people do add weight when their birthdays seem to come every six months, but this extra weight is not inevitable, necessary or natural.

When you were a teenager you used most of the food you ate by strenuous exercising, working, and playing. And some of it was used for growth and development of your body. But as you grew older and spent less time on the golf course and tennis court and in the swimming pool, you exerted less energy. But did you cut down on the calories? Absolutely not. How often have you heard an Army Aviator say on the way home with the car pool, "Boy, am I bushed." Or heard one of them say after a 4-hour CR flight, "All I want to do when I get home is hit the ole sack. No supper, no bedtime toddy, no nothing. Just hit the hay." On the other hand when was the last time you heard one of them turn down a rich dessert in deference to his advancing years? Usually, if he turns down a piece of Mama's delicious molasses pecan pie, it's because he just had one.

Instead of recognizing and heeding warning flags, fat people blame their daily aches and pains on a too-soft mattress or no arch supports in their shoes. They tire more easily because "I'm not as young as I used to be," or "I've been smoking too much lately," or "My wind is not as good as it used to be." They will latch onto any reason except the valid one: overweight.

The human body is a wonderful creation, a precision machine of the highest order. But just as the airplanes that Major Plumpe flies are designed to carry a maximum weight, so the skeleton and heart are meant to accommodate just so much weight. Unnecessary weight strains the whole system and lets you in for a host of serious troubles.

Abusing your heart by being overweight is like betting against yourself. The prize is the right to be around to watch and play with your grandchildren. Extra weight increases your chances of developing heart trouble, diabetes, high blood pressure, hardening of the arteries and liver trouble. Any one of these conditions could ground the Army Aviator faster than he could spend his last flight paycheck. Figuratively speaking, if you are pushing (or pulling) your weight around, you'd better buy some flight insurance. You'll need it after you're grounded.

WHY DO ARMY AVIATORS GET OVERWEIGHT

First, they can get the necessary food. Their base pay (plus flight pay) indicates that they can afford to eat heartily. Overeating is the real crime and the usual cause of obesity. You don't have to be a glutton to overeat. It's merely a matter of eating more food than your body needs for daily exercises and work. No two people are alike in body, in energy output, in their need for food. Overeating for a slightly built office worker can mean malnutrition for a brawny construction worker.

Second, American technology tends to produce more effort-saving devices with each passing year. This is especially true in automobiles — the second most popular mode of transportation for Army Aviators—and automobiles are so-o-o handy around Army posts. You don't have to walk anywhere anymore. If you don't wish to call Post Transportation, and prefer to drive your own car, what efforts do you put forth? Why your car has power brakes, power steering, and automatic shifting! Guess where all the energy from that last meal goes! And there never was a lot of strenuous exercise in-

An occasional game of golf or tennis won't take off those extra pounds!

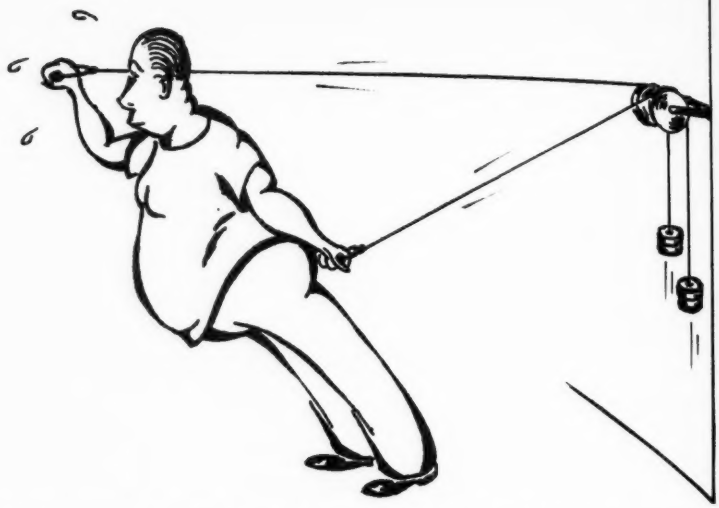
volved in flying an L-19, was there?

OVERWEIGHT ADJUSTMENT

Managing weight is finding out your optimum weight and adjusting the twin contributing factors, food intake and exercise, to reach that weight. The object is to reduce your food intake below what your body needs until you burn off the excess pounds. Then take in only as much food as your body needs to maintain the correct weight. The majority of overweight people merely worry about their condition once in a while — and do nothing about it. On the other hand, some people go on a "crash program" diet and eat lettuce and drink water until their weight comes down. By this method they reduce their weight in a short time, but inherent in such a program is the danger of flying complicated aircraft in a weakened condition. Moreover, a crash program lowers safe physiological standards causing people to be more susceptible to diseases. Too, they look haggard, are nervous and irritable, and usually slip back into their old heavy eating habits within a short time.

Between these extremes is the person honestly concerned about his weight. He tries recommended diets for a prescribed duration. He loses a few pounds, acclaims his success loudly, then gives up gratefully and returns to the family tradition of hearty eating.

The danger in all these methods of weight control is that the cause (eating) is a daily habit and the prevention (dieting) is merely an occasional undertaking. Much of the trouble comes from the concept of a diet as a cure-all for people who are overweight. The announcement that you are on a diet invariably brings comments like, "Oh yeah, for how long?" or "You are not supposed to eat the diet **and** the regular meal, Joe!" or this one, "Joe, when the doc said watch that stomach, he didn't mean get it out there so far!" or "Remember our steak dinner date, Friday night," ad infinitum. The first problem to master in starting a diet program is the acceptance that you'll be living with it for a long time. As long as you eat regularly you must "eat sensibly."



A systematic schedule of exercises will help you lose weight

WHAT YOU CAN DO

"What can be done about overweight? The best thing of all is prevention. A few lucky souls can eat like horses all their lives and remain trim. For the rest of us, there comes an age — between 25 and 40 years—when it suddenly becomes very easy to put on excess weight. Usually you can detect this yourself, with occasional weighing, and **then** is the time to cut down on your intake. Eliminate between-meal snacks and foods rich in calories. Beware especially of cocktail parties! At any cocktail buffet, one can easily stow away enough calories to cover his needs for 2 or 3 days! A serious and determined drinker can do even worse, for alcohol is a rich source of calories.

"Once prevention has failed, and you've become attached to your fat, removal is a long and painful process. The usefulness of exercise in control of weight is greatly overrated. The only practical way to eliminate fat is to reduce the intake of high caloric food. Once down to a proper weight, you must watch your diet indefinitely, or you will regain the weight. An 'informal' diet — simple avoidance of overeating — will often suffice to reduce your weight. If not, you should get a definite and well planned diet from your Flight Surgeon. The most important qualities for a successful diet are SELF-DISCIPLINE AND SELF-DENIAL. Once you've been fat, you must exercise self-control in eating and drinking for the rest of

your life. If you allow yourself to remain obese, you are endangering your health, your career, and your very life!!" (Extract; "Flight Techniques," Alaskan Air Command, October, 1955.)

A flight surgeon is worth his weight in controlled calories. First of all he is a physician. A consultation with him determines how much weight you should lose and at what rate. He will set up a diet schedule that will let you reduce to normal healthy weight safely. He may or may not prescribe simple calisthenics in addition to your regular "PT" program. He will not give you a crash diet because it's dangerous.

Second, part of the flight surgeon's job is to keep Army Aviators in top physical condition. Contrary to much opinion, he doesn't want to keep you from collecting flight pay. It's his job to keep you flying. And when you realize that he is on your side, you're more apt to eat sensibly.

Finally, the flight surgeon will ask you to report back at regular intervals. This tends to add discipline to any diet program and you'll hold the line on overeating. Once you are back to normal weight, he'll advise you on how much to eat for your level of activity and exercise. He'll tell you how long to keep on the diet. You'll be surprised how your system will adjust to the new diet and how soon it will become a habit.

Strenuous one-time exercises help very little

Case histories furnished by the Flight Surgeon, USAAVNS, Fort Rucker, Alabama, clearly show how sensible eating is the clue to losing weight. (All these men are Army Aviators on active duty. All were weighed fully clothed except for blouses.)

CASE A. This 5′ 8½″, 35-year-old flier weighed 199½ pounds when he reported to the Flight Surgeon. He was placed on a 1500 calorie diet. At the end of 49 days he weighed 181—a loss of 18½ pounds.

CASE B. This man lost 24½ pounds in 53 days on a 1500 calorie diet. He is 36 years old, 5′ 11″ tall. He weighed 232½ pounds when he started dieting; 53 days later he weighed only 208 pounds.

CASE C. A 5′ 10″, 41-year-old flier weighed 190 pounds when he reported to the FS. Twenty-three days later, after being placed on a 1000 calorie diet, he had lost 11 pounds.

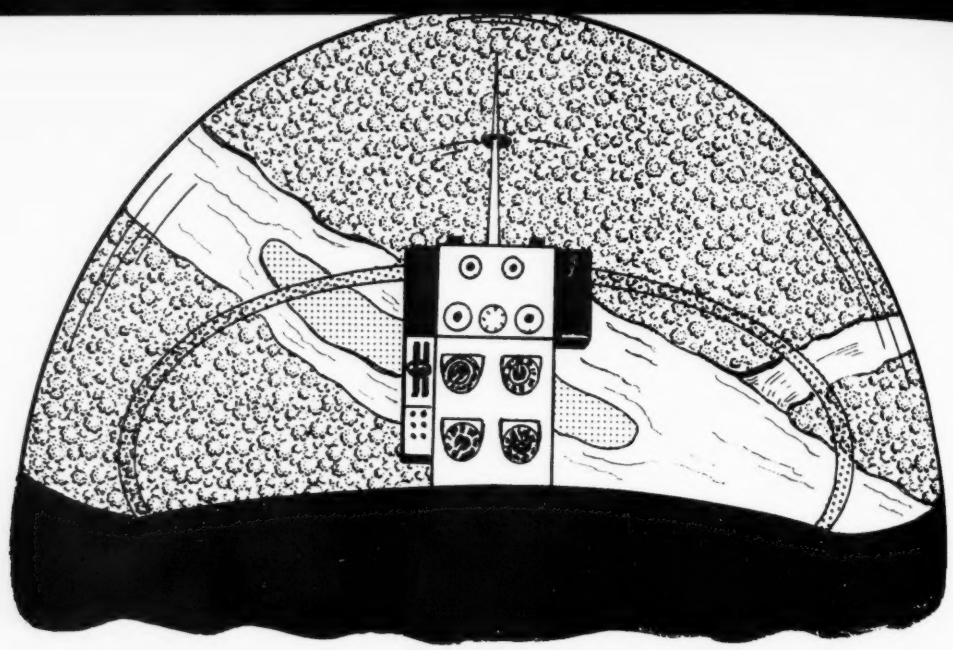
Dieting is not cutting out a few fattening foods, not calorie counting everytime you sit down to the table, but a trimming down on all foods. It is a simple system: **just eat less of everything.** Effective habits must be something we do unconsciously; eating less of everything to maintain a proper balance between food intake and energy output must become a habit. After getting down to the proper weight, the main concern for the rest of your life is watching. A bathroom scale is the easy way to check weight trends. If necessary, a chart or graph will help fix this ritual of weighing in your mind. It must be regular and habitual to be effective. Not necessarily daily, but at stipulated times each week.

This may sound gloomy, but there is definitely a brighter side. Remember that the food you eat must balance with the energy you use in daily work and exercise. If you regularly work or exercise more, you can eat more. Exercising in itself is not the total answer. For example, walking 35 miles at a good clip will use up about a pound of unneeded fat. You'll find a definite time set aside for exercises is good as long as it doesn't interfere with other activities. Try getting in exercise with work. Walk a little more. Walk some after you get home from work. But whatever you do, do it regularly.

Build it into your routine so that it becomes a regular habit. It's the regularity of exercise, not the tremendous, one-time exertion, that helps keep you in trim, on flying status, and drawing flight pay. . .

About 1100 hours Major Plumpe appeared at the office of the flight surgeon. Would the sergeant inform the Colonel that Major Plumpe was outside? In a few moments he heard, "Come in, Major, Have a chair by the desk. I'll be with you just as soon as I find a medical report. Ah, yes, here it is.

"Do you recall a Captain T. H. Inn? I believe you were with a medical evacuation group in Korea, weren't you? Well, Captain Inn has applied for a medical discharge and is in a hospital for examination. Something about recurring malaria. We need your statement about this condition when your helicopter brought him in from the front lines in 1953. You can help a great deal, Major, if you'll just fill in the details here."



CIRCLE OF ACTION

Lieutenant Bobby M. Knight, Arty

THE TIME IS 0650 on a day in the near future. You, the pilot, are on an early morning courier run to Army Headquarters — late, as usual. You are clipping along at high cruise when you feel a couple of twitches in the foot pedals, then . . . silence. The pitch goes down mechanically; the silence is terrifying.

Fifteen hundred feet below, you see the trees, tall and wicked. In front of you and into the wind, a small island sits in the center of a swollen, muddy river. To the right there is an old abandoned mill site. To the left and downwind, you see an old strip mine—smooth, clear, and inviting. Airspeed is now stabilized at 60, rotor in the green. You think, "Which should I choose? Which can I make?"

More silence, then panic. Terrified, you take the last choice. After all, it's smooth and inviting. Looks like a good place. A turn to the left — banked too steep, lost a lot of altitude. The trees are coming up, pull a little pitch and you'll make it. Over the trees, you still have 50 feet to go, RPM TOO LOW, and downwind.

Two hours later you are in the litter chopper and on the way to the hospital — glad your AAAA check is in. "Wish I'd tried for that sand bar, or that old sawmill. Guess I'll never know if I could have made it," you reflect.

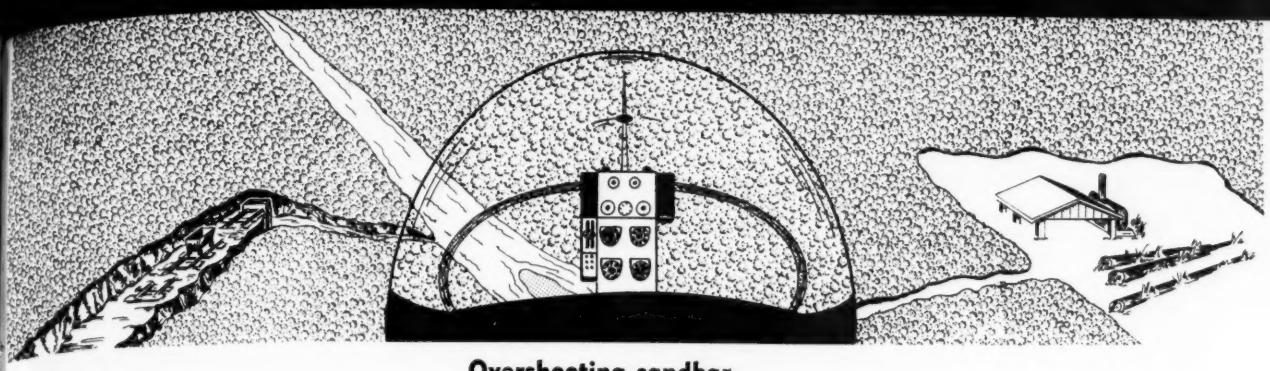
This is where Sam was wrong; he could have known, and almost in the amount of time it took him to make his near fatal decision.

Did you ever hear of "Circle of Action?" If not, it's 2 to 1 you've been using it for years unconsciously. Years ago while flying a clipped wing Stearman (rate of descent proportionate to that of a helicopter), the best instructor pilot that ever lived taught me to "keep the spot still on the the windshield" while practicing 180 degree sides.

He never heard of "Circle of Action," but he knew it was there. Since my early days of instruction, I've found it useful in "zeroing in" on a couple of corn patches, a bridge abutment, and a rice paddy.

What is this "Circle of Action?" It is an imaginary spot or circle on the windshield or bubble inside which the background is motionless. The circle is imaginary and must be visualized; however, the motionless background is visible, and the point between your eye and this motionless background is the "Circle of Action."

The contrast of the "Circle of Action" is the movement of everything outside the circle away from the center of the "Circle of Action." This **action** away from the motionless center is where the term "Circle of Action" originated. It is the contrast, or action away from the center, that allows this theory to work for us. If our proposed landing area is slipping **up** the bubble (or windshield) and away from the motionless cen-



Overshooting sandbar

ter, then we are falling short of our intended spot and must correct accordingly by decreasing our rate of descent or by increasing our glide ratio. If increasing the glide ratio is impossible, then we must find an alternate landing spot. Thus, to benefit from the "Circle of Action," which can be recognized immediately after RPM AND AIRSPEED are stabilized, every pilot must know the best glide speed and rpm for his particular aircraft.

If the intended landing spot is moving down the bubble or windshield, we are overflying our spot and, in the helicopter, we must decrease our airspeed and (optional) increase our rotor rpm. In fixed wing, we may drop flaps, slow airspeed, or slip the aircraft until we are on a line to our intended point.

How do we learn the "Circle of Action?" The best way is to have someone in the unit, who is experienced and well informed, teach the unenlightened. The second best way is the normal approach method. Set up a barrier and a panel, and on the first approach, use an underarcing situation with a high rate of descent. Let the student see that the barrier rises above the panel as he falls short of his intended landing spot. Try to show him the motionless spot that is short of the panel.

Next, set up an approach with a slow rate of descent and an overshooting situation. Let the student see that the barrier moves down the windshield (or bubble) and under the aircraft.

Last, set up a normal rate of descent with the barrier on line with the panel. The student should then see that as long as a constant rate of descent is maintained, his "Circle of Action" is on line with the barrier and the panel.

The third method of learning the "Circle of Action" is the reliable trial and error method. Still using a panel, make several approaches consisting of underarcing, overarcing, and normal rates of descents. In a helicopter, try several autorotations to a panel. Try using high rotor rpm and then decreasing it, and watch the panel change positions on the bubble. A little effort and a pilot can teach himself to be an expert.

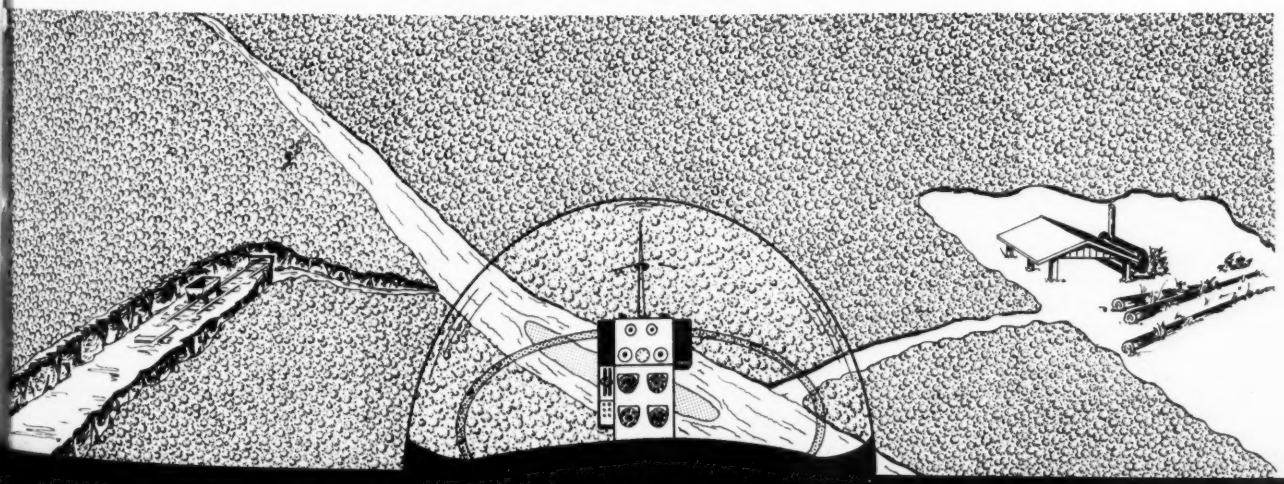
The "Circle of Action" depends on the stabilized airspeed and rate of descent and, therefore, is not affected by density altitude or gross weight of the aircraft once stability is reached. Wind, although changing the line of descent, will not affect the "Circle of Action" once stability of rpm and airspeed is reached.

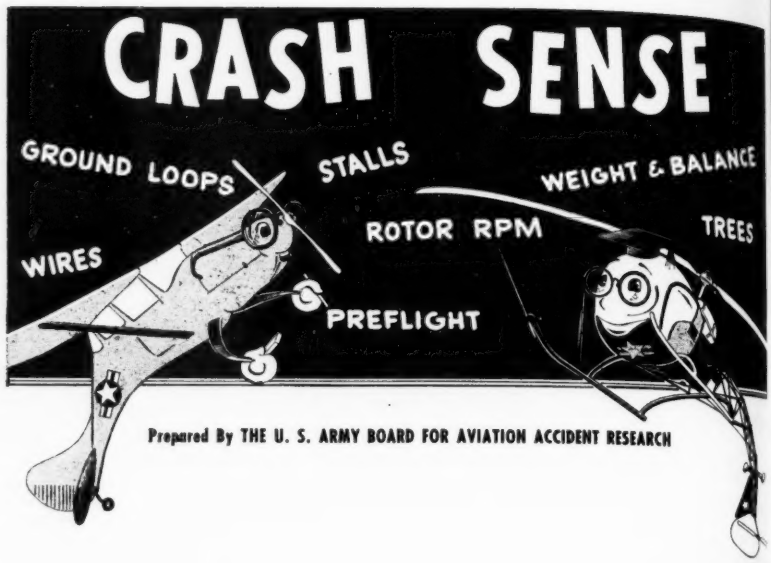
Thus the "Circle of Action" is there for our use in all forced landings, except when the ground cannot be seen. This is applicable to fixed and rotary wing aircraft; however, due to the high rate of descent, the "Circle of Action" is more easily recognized in the helicopter.

Every unit should set a training goal to have each pilot checked out on the "Circle of Action." A pilot on a forced landing who knows where he is going to land will not panic.

Lt Knight is an instructor in the Shawnee (H-21) Branch of the Department of Rotary Wing Training, USAAVNS, Fort Rucker, Alabama. He is dual rated and instructor pilot in the H-13 and H-21.

Heading for sandbar head-on, using "circle of action" as guide





AVIATION PSYCHOLOGISTS, flight surgeons, and aviators in all walks of life have written reams of material to teach us that aviators are human beings, subject to emotional distractions and physical limitations. Despite these lessons, we continue to treat human failure in caveman style. To the inherent risks of a demanding profession, we add the fear of punishment.

Through engineering knowledge and technological advances, we have learned to build and maintain our flying machines in an up-to-date, progressive manner. Yet, when men who fly these machines err, we often employ the bludgeon of punishment when a delicate tool of corrective understanding is indicated.

THE ACCIDENT

The aviator performed an abbreviated runup in an L-19A Bird Dog which consisted of a magneto check and a static power check. He then reduced power to about 1700 rpm and, without applying flaps, advanced throttle to full power and released the brakes for a maximum performance takeoff on a 950-foot strip. The aircraft did not become airborne until it had rolled approximately two-thirds the distance of the strip. It then settled to the ground briefly and flew off again, passed under telephone wires and headed into trees. The aviator realized the aircraft would strike the trees. He cut the power and brought the nose up to reduce impact speed. It struck the trees and crashed to the ground. Pilot and passenger escaped with no injuries; the aircraft was destroyed.

Abbreviated runup . . . reduced power . . . no flaps . . . no go!

PROSECUTION

On the face of it, this accident would appear to have resulted completely from carelessness. It seemed to be a simple case of the pilot forgetting to use flaps when strip conditions definitely called for their use. And that's exactly what the 285 listed: "Pilot failed to use flaps during short-field takeoff." The corrective action? "Pilot was punished under Article 15 for dereliction of duty."

So far, the facts would ap-

pear to support the finding and indicate the corrective action. Now, let's take this case one step further and examine the emotional and physical makeup of the pilot. Let's assume that the pilot did not intentionally forget his flaps and look for evidence of fatigue or distraction.

DEFENSE

The doctor who examined the aviator after the accident made these findings:

The pilot felt "loggy" and tired on the day of the accident, chiefly because he arose at 0145 hours after 2½ hours of sleep for an alert and command post exercise. He had slept for 11 hours during the 37 hours prior to the accident.

"After talking with————— ————, his colleagues, and the psychiatrist, I believe that the chief reason for this forgetting was psychological tension, worry and concern over personal problems."

Next, the old bugaboo, accident proneness, rears its ugly head. This aviator had experienced another accident a short time before. Because of these two accidents, it was recommended that he appear before a flight evaluation board to determine his fitness as a pilot. Regardless of individual accident cause factors, we continue to apply a mythical solution, based on a completely unfounded and unproved theory (see Prone to Err? U. S. ARMY AVIATION DIGEST, February 1959).

When an aircraft component fails or malfunctions, the chief concern of maintenance personnel is to determine the cause and correction. This is a constructive approach and will result in more efficient aviation. Why must we deviate when dealing with human beings who fly aircraft?

Aircraft that are not capable of their best performance are grounded and repaired. Yet, we push aviators to the limits of physical endurance, ignore their emotions, and punish them for not maintaining peak performance. Is this logical?

SUMMATION

Does an aviator deliberately risk his neck? With few exceptions, this is to be greatly doubted! Doctors have repeatedly emphasized that fatigued aviators fly at a great disadvantage. Our mental alertness is directly related to physical condition; a tired aviator is subject to forget those things he should do, or attempt those things he should not do. **We ground the aircraft for excessive mag drop, but expect faultless performance from tired aviators.**

Equally important, the psychiatrists tell us, are the emotions. An emotionally aroused aviator is unfit to fly, more so than if he were flying with a cold, bellyache, or a broken leg. The effects of emotional reactions are dangerous even beyond the dulling of mental ability. Under its influence, normally safe pilots will often notice things they should do, recognize things they shouldn't do, understand the danger, but do the wrong thing anyway!

Will punishment correct the cause factors for this type of accident? Can a stone axe be used to adjust a complex carburetor?

Fear of recrimination will not free an aviator's mind for demanding tasks. Moreover, this fear, through its distraction, can be the cause rather than the prevention of accidents. Disciplinary action should not be permitted to become a "Sword of Damocles" hanging over the head of Army Aviators. Fear of this type results in behavior traits which are usually manifest in those accidents in which human error is a cause factor resulting from distractions, fatigue, or lack of proficiency.

Prisoner, face the bar!

VERDICT

Total concentration is demanded of aviators while piloting aircraft. Unlike other soldiers, Army Aviators cannot stop their machines at will and take stock of any given situation. They must constantly plan ahead and be conditioned through training and experience to meet any flying situation which can confront them.

Aviation unit commanders are in position to daily observe the activities and behavior of aviators under their command. It requires no special psychiatric or medical training to recognize fatigue or changes in behavior in those individuals with whom we are in daily contact.

Good morale, adequate medical supervision, and continuous training are tools that will open all commands to more effective accident prevention. The men most suited to use these tools are aviation commanders.

Alley Oop needs his axe. Let's return it and give logic a try!

"Solution?"

IF THE SHOE FITS

Plump matrons who cram size 9 tootsies into size 6 spike-heel pumps are sure bets for toe realignment jobs from the nearest foot doctor. They suffer painful discomfort solely to prove dainty heritage and drawing-room elegance.

An Army Aviator turned his Sioux toward a group of trees to practice confined area work. He realized that flying between the trees would be close and asked his passenger if he thought they could make it. The passenger answered "No." If the pilot heard this, he gave no indication and continued hovering along the trail leading into the wooded area. A vibration was felt as the main rotor blade chopped into the tree on the left. He moved the Sioux slightly and the blades struck the tree on the right. The aircraft rolled to the right and crashed to the ground. Pilot and passenger escaped without injury. Distance between the trees was found to be 34' 7"; the diameter of the Sioux' main rotor blades, even in static condition, is 35' 1½".

The matrons' motives are easily understood. They accomplish their aims with shoehorns and sweating clerks. What drives aviators to attempt the same act, with no aids, is completely unknown.

PLAYING THE ODDS

Track amateurs usually risk the long shots and drop their money on nags better suited for plowing. Gambling pros in striped vests generally play it safe and follow the laws of probability; these are the cool gents who drive from track to track in high-powered convertibles.

A Bird Dog aviator skipped a ground reconnaissance, taxied to the end of a sod strip and began his gamble. Winds were light and variable. During initial ground roll, the aircraft veered to the left and the aviator slammed on right rudder and brake. The aircraft broke ground at the extreme end of

A little too confining for practice

Pilot omitted ground recon

the strip and began to climb out. Here, this long shot began to fade. The left wing struck one tree and the right wing another. The aircraft crashed to the ground and began to burn. Pilot and passenger crawled uninjured from the wreckage.

BLINDERS

Another aviator was cleared to make a contour approach at his own discretion. Weather was clear, with unlimited visibility and calm winds. Eyes focused on two large trees to his right, the aviator was not aware of a small tree in his approach path until the left wing chopped into it. He managed to bring the Bird Dog home with no further damage.

PHOTO FINISH AT THE WIRE

A Sioux pilot made a high reconnaissance, completed a descending turn to base and final. He noticed a telephone pole with wires extending away to the right. He failed to see another pole to the left, partially obscured by heavy foliage. Suddenly, his passenger yelled, "Watch out for the wires!" Evasive action came too late and the aircraft plowed into the wires. The pilot managed to limp to a controlled landing without injury to himself or passenger.

The striped-vest gents study their odds and know their horse-flesh. They may not enjoy the same thrills from racing as long-shot amateurs, but they bring home fatter wallets.

Striped-vest aviators who invest reconnaissance time for strange area operations probably don't receive as much thrill from their flying as the amateurs who dash in and out hell-for-leather. These gents maintain that longevity and retirement benefits are well worth the extra effort.

Thrill of long odds or winning satisfaction? Where will your dough ride?

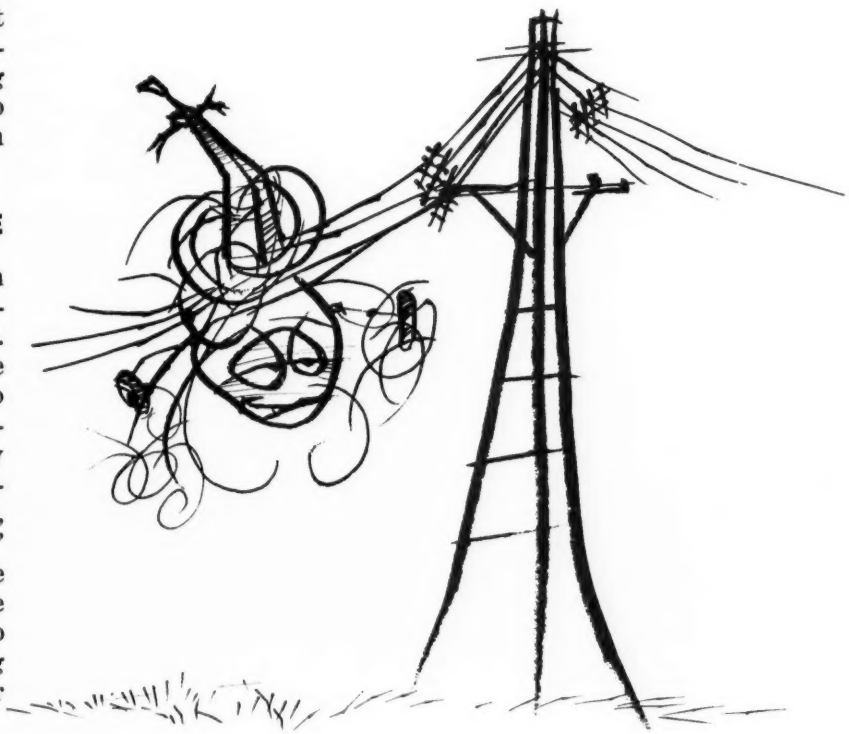
OLD ROCKING CHAIR'S GOT ME

The Sioux is a fine VTOL aircraft. It will take you into and out of confined areas and get you where you'd like to go. But it ain't grandma's rocking chair!

The Army Aviator made a complete and thorough preflight inspection of the new Sioux, cranked it up and got airborne. Another aviator nearby reported stiff cyclic movement in a like aircraft and suggested that the first aviator check his cyclic.

What occurred next is best described by the witness: "I was standing fire guard approximately 60 feet from the

Look out for wires



The Sioux ain't Grandma's rocking chair

crash and had watched the performance of all maneuvers. The pilot moved back and forth over the grass from left to right, possibly 20 times. Sometimes it seemed that the main rotor blades would hit the ground—I was a bit frightened. On the last move to the right his skids touched the ground. The helicopter then fell to the left and down and the gas tanks ruptured and burned upon impact. It seemed that the left skid hit the ground before the main rotor. The pilot and passenger got quickly out and I helped to put out the fire with the portable foam bottle I had."

Aviators with an irresistible urge to rock should visit grandma!

NEAR ACCIDENT

This one goes back to my early flying days, but I've been ashamed to tell it before. We got a call from the CO who had been forced down in an open area by engine failure. He requested someone fly a mechanic out to work on the aircraft. I got the nod for the job, and the mechanic, his toolbox and I were soon in the air. We located the CO's downed aircraft and I landed and taxied up beside it. Rather than delay the CO, I asked if he would like to take my aircraft and continue on. He seemed overjoyed to do so, jumped in and fired up. Only as he was taxiing away, did he yell back that we were in the midst of a leper colony.

Needless to say, the mechanic and I performed hurried maintenance on the aircraft and cranked it up. I told the mechanic I would fly it around the field once before we left. He threw his toolbox aboard, jumped in and told me I was not leaving him on the ground. Looking at the lepers who had approached the edge of the cleared area, I sympathized with him and took off.

The aircraft flew fine for about 5 minutes, then the engine began sputtering. By jockeying the throttle, I was able to remain airborne and head toward regimental headquarters. It was a custom in those days to buzz headquarters for someone to drive out to the unattended strip to pick up arrivals. I had the choice of attempting a buzz job with a sick engine or walking five miles. You can guess that I made the wrong choice. I pointed the nose down toward headquarters and immediately the engine stopped. By pure good luck and a straining carburetor, we reached the end of the strip and the aircraft settled undamaged.

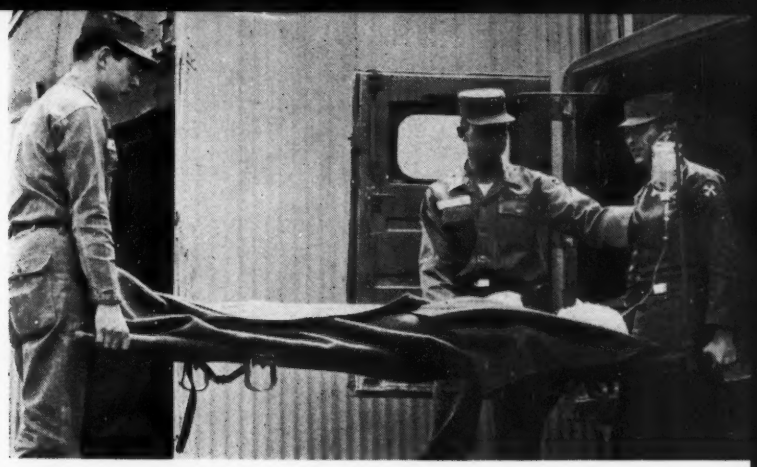
NEAR MISSES

"I completed a flight over jungle in a Beaver and picked up two VIP passengers to return to the unit. With the forecast winds, the return flight should have taken 1 hour and 15 minutes. There was more than enough fuel aboard for this amount of flying, so I did not bother to have the aircraft refueled. As was usual in that part of the world, the forecast winds were entirely inaccurate, and I found myself flying over the jungle at night 2 hours after takeoff. When I finally sighted the home field, all fuel gauges read empty and we rode the fumes down to our landing. Actual measurement showed approximately 6 gallons of fuel remaining. I will **not,** repeat **will not,** rely on forecast winds and I will always refuel at every opportunity."

This lad learned the hard way. How will YOU learn?

"During maneuvers I was carrying a general out to meet the corps commander. I lost my way and landed the Raven beside a farmer in a field to ask directions. In embarrassed haste I left the aircraft idling, without locking either pitch or throttle, and hurried toward the farmer. I had gone about ten steps when I heard the Raven engine begin to accelerate. I whirled around and raced back to the helicopter just in time to see the pitch begin to creep up. The general already had one leg out of the helicopter when I caught the pitch and slammed it down."

No comment needed.



Clockwise: Seriously injured soldier is transferred to waiting helicopter while Capt George A. Moyers, CO, 50th Med Det adjusts glucose bottle. Sgt McClelland assists in loading while Lt Freddie Mills hurries to helicopter. Moments later the patient is en route to evacuation hospital.

SALUTE TO MEDICAL DETACHMENTS

Stationed throughout the world, Aviation Medical Detachments provide evacuation support for surgical hospitals, Corps, Division, and allied armies.

On call day and night, these helicopter ambulance companies perform routine and emergency missions like those shown in the pictures at right. A soldier with severe facial injuries needed immediate advanced surgical treatment. Alerted for the emergency mission, the Medical Detachment had the soldier under treatment 35 minutes after takeoff. The U. S. ARMY AVIATION DIGEST salutes the officers and men of the Medical Service Corps everywhere on their operational readiness.

ABOUT THE COVER

In the predawn blackness of military airfields, while the rest of us are comfortably bedded for several more hours, a group of silent men troop out to wake the sleeping birds. Flashlights flicker through pages of forms and busy hands explore cold metallic skins, check tire pressures, pull propellers, uncover rotor blades and check the million other things which must be done while the birds still sleep. Soon, the staccato growl of auxiliary power units is heard over squeak and slam of cowls. Then, one by one, the birds roar to life. Yellow exhausts flare brightly, subside to efficient pulsing blue; propellers stir auroras in the dampness and glitter in flashes from red, green, and white navigation lights.

Anxious eyes watch cylinder head and oil temperature needles creep across their dials. Throttles move forward and engines pop under the sting of mag checks. Plugs are changed and carburetors finely tuned until every engine roars with a healthy throb.

As the first faint streaks of light appear in the east, the fields are silent again. Pencils move in forms, guaranteeing the birds ready for flight. The figures, noisy now with awakened camaraderie, return to lighted line shacks, hot coffee, and cigarettes. For a brief time they rest until sleepy aviators come to claim their charges, then scatter to hangars or back to the flight line for another busy day.

Unsung, tireless and dedicated, these men, day after day, night after night, work, sweat and dream aviation. This issue of the U. S. ARMY AVIATION DIGEST is dedicated in grateful appreciation to aviation mechanics.